NATIONAL INSTITUTE
FOR HEALTH AND WELFARE

Pia Korpisaari

DISCUSSION PAPER

Electronic Death Certificate

Report Series of European Commission Grant Agreement

36 | 2016

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ISBN 978-952-302-752-7 (online publication)
ISSN 2323-363X (online publication)
http://urn.fi/URN:ISBN:978-952-302-752-7

Helsinki, Finland 2016

Abstract

Pia Korpisaari. Electronic Death Certificate. National Institute for Health and Welfare (THL). Discussion paper 36/2016. 91 pages. Helsinki, Finland 2016.
ISBN 978-952-302-752-7 (online publication)

Electronic Death Certification (EDC) was a jointly funded action by the European Commission and the National Institute for Health and Welfare (THL). The action aimed to improve the quality of CoD statistics and to strengthen the development of electronic tools, processing and data sharing for statistical purposes.

The ultimate objective of Eurostat for this work was to comply with the WHO guidelines and Eurostat CoD task force recommendations, to fasten the national process from issuing, verifying, archiving of death certificates to statistical production, and to improve the overall quality of death certificates.

The European Commission awarded a grant "E-certification of causes of death" for National Institute for Health and Welfare to achieve substantial results:

- A good overview of the current national situation on death certification
- Tools and practices for handling of electronic cause of death information
- A 20 % share of death certificates to be issued electronically after the action
- A detailed plan to help achievement of 100 % electronic death certificate rate.

Keywords: electronic death certificate, digitalization, Eurostat, mortality data

Tiivistelmä

Pia Korpisaari. Electronic Death Certificate. Terveyden ja hyvinvoinnin laitos (THL). Työpaperi 36/2016. 91 sivua. Helsinki 2016.
ISBN 978-952-302-752-7 (verkkojulkaisu)

Kuolinsyytietojen sähköinen ilmoittaminen oli Euroopan komission rahoittama hanke vuosina 2014 - 2016. Hankkeessa selvitettiin ja kokeiltiin mahdollisuuksia kuolinsyytietojen sähköiseen ilmoittamiseen, siirtoon ja käsittelyyn. Osa hankkeen tavoitteista valmistui Terveyden ja hyvinvoinnin laitoksen (THL) oikeuslääkinnän tietojärjestelmäprojektin tuotoksena. Hankkeen yhtenä tavoitteena oli tiivistää yhteistyötä Tilastokeskuksen kanssa sekä nostaa oikeuslääkintää näkyvämmäksi.

Hankkeessa toteutettiin paperisten kuolintodistuslomakkeiden lomakeuudistus. Kaikki kuolintodistusta varten tarvittavat tiedot käytiin läpi, ohjeistusta lisättiin ja parannettiin. Kuolintodistukselle määritettiin sähköinen lomakerakenne, joka on maksutta saatavissa THL:n ylläpitämästä Koodistopalvelusta. Sähköinen kuolintodistus pilotoitiin oikeuslääkinnän omassa tietojärjestelmässä, jossa laaditut kuolintodistukset siirtyvät tarkastettuina ja sähköisesti allekirjoitettuina Tilastokeskukseen tilastoitaviksi. Nyt käyttöönotetun yhteyden kautta THL ilmoittaa kuolintiedot sähköisesti ja reaaliaikaisesti myös väestötietojärjestelmään. Vuonna 2015 kuoli 54 142 henkilöä. Kuolemansyyn selvityksistä lähes 20 % on tehty THL:n toimesta. Sähköinen ilmoittaminen edistää digitalisaatiota tallennustyön vähentyessä. Samalla kuolintietojen ajantasaisuus on parantunut.

Hankkeessa valmisteltiin myös kansallinen suunnitelma kuolintietojen siirron sähköistämiseksi kattavasti koko maassa. Tavoitteena on velvoittaa kaikki toimijat käyttämään samaa hyväksyttyä kuolintodistusrakennetta. Suunnitelman toteuttaminen vaatii yhteisen palveluarkkitehtuurin.

Avainsanat: sähköinen kuolintodistus, digitalisaatio, Eurostat, kuolinsyytiedot

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Pia Korpisaari

Objective 1: Assessment of the Current Status in Finland

Deliverable for Objective 1
October 2014

Overview

Under the present Act 459/1973 any health care unit or licensed physician must immediately report any decease to Population Register Centre of Finland and National Institute for Health and Welfare (THL). THL reports onwards to Statistics Finland. Further provisions on the implementation of the present Act may be given by government decree. In accordance with section 2 of the present Act 459/1973, a deceased may be buried or donated for medical research only after a thorough cause-of-death investigation. As defined in the Decree 948/1973, an attending physician must immediately after a cause-of-death investigation provide a death certificate to be submitted to National Institute for Health and Welfare (THL). The Forensic Medicine Unit of THL is responsible for all Finnish forensic autopsies and verification of all death certificates issued in Finland.

Death Certificates

A death certificate is an important document to prove a proper cause-of-death investigation. It includes a burial permit or permission for donation for medical research. It is a legal document to pay respects to the deceased. Statements of causes of death together with a manner of death are essential forensic information. An attending physician will issue a death certificate together with a burial permit after a cause-of-death investigation. Death certificates will be sent to Statistics Finland.

Approximately 80 % of all death certificates are issued by the attending physician. A forensic autopsy is performed in 20 % of the cases. National Institute for Health and Welfare (THL) receives about 40 000 death certificates every year for verification. In addition, the Forensic Medicine Unit of THL is responsible for carrying out around 10 000 forensic autopsies a year. Altogether approximately 50 000 death certificates will be verified, all in a paper format.

Death Certificate Forms

In Finland there are two different forms of death certificate, both in Finnish and in Swedish.

1. Death certificate for a person aged 28 days or over (Appendix 1).
2. Death certificate for stillbirths and deaths in the first 28 days of life (Appendix 2)

The forms include:

- death certificate
- any additional pages
- burial permit
- notification of death to the Population Information System
- notification of stillbirth to the Social Insurance Institution of Finland (stillbirths only).

In Finland new updated death certificate forms have been available since 1 January, 2014. The main drivers for renewal work have been both domestic needs and European Commission regulations on statistics on causes of death. Finland has been granted derogations with respect to the transmission of statistics pursuant to Regulation (EC No 1338/2008 of the European Parliament and of the Council on Community statistics on public health and health and safety at work), as regards statistics on causes of death. Causes of death are based on the international classification of diseases (ICD), developed and maintained by the World Health Organization (WHO). Statistics on the causes of death are based on two pillars: medical information contained on death certificates, which may be used as a basis for ascertaining the cause of death; and the coding of causes of death following the WHO-ICD system. In Finland there has been also a need for better instructions.

The new death certificate forms (Appendices 1-4) are confirmed by the Ministry of Social Affairs and Health. The renewed forms are effective from 1 January, 2014.

eServices

The concept of electronic services a.k.a. eServices represent applications utilizing the use of information and communication technologies (ICT). A good example of such a service is an eForm (electronic form) i.e. a computer program version of a paper form. To access eServices, an online system that allows organizations to authorize their employees or a third party, is needed. When designing eServices it is important that they fit smoothly into the service consumers' processes and organization.

Patient Information Systems and Finnish National Archive of Health Information (KanTa) in Finland

Patient Information Systems are designed to improve access to patient information through a central electronic information system. Traditionally all information is maintained in a paper format in internal systems. Electronic Health and Medical Record systems (EHR, EMR) help to collect and save all patient related data in one place.

In Finland, special and primary health care units in both public and private sectors have tens of different patient information systems in use. The most common systems are Abilita / Medcix, Doctorex, Effica, Finstar, HealthNet, Esko, Mediatri, Miranda, Pegasos, Praxis, ProSalus and ProVita plus, Acute, Doctor, Doctorex, Mediatri, Medicus, MediPro, MediTree, ProVirex and SoftMedic.

Using of patient information systems aims to increase effectivity, safety of patients and customer satisfaction in an organization. They should enable information sharing between all stakeholders by supporting and guiding doctors, nurses and rest of the staff. A flexible system will adapt to changing needs of all stakeholders.

The national data system for healthcare services, pharmacies and citizens is called KanTa (The National Archive of Health Information). Services include electronic prescriptions, Pharmaceutical Database, My KanTa pages, and Patient Data Repository. Services are deployed in phases throughout Finland.

Use of patient information systems is not enforced in Finland by any means. Documents due to medico-legal autopsies are not medical records but, on the other hand, documents due to medical autopsies are. Thus, Patient Data Repository provided by KanTa services cannot be utilized without changing the law. It, however, is not to foresee.

New Death Certificate Forms

A notification of death will automatically be registered in population information systems and by others in authority (Figure 1). A death certificate issued will be submitted to National Institute for Health and Welfare (THL) who will forward it to Statistics Finland. A death certificate will be issued after all cause-of-death investigations are done and ready.

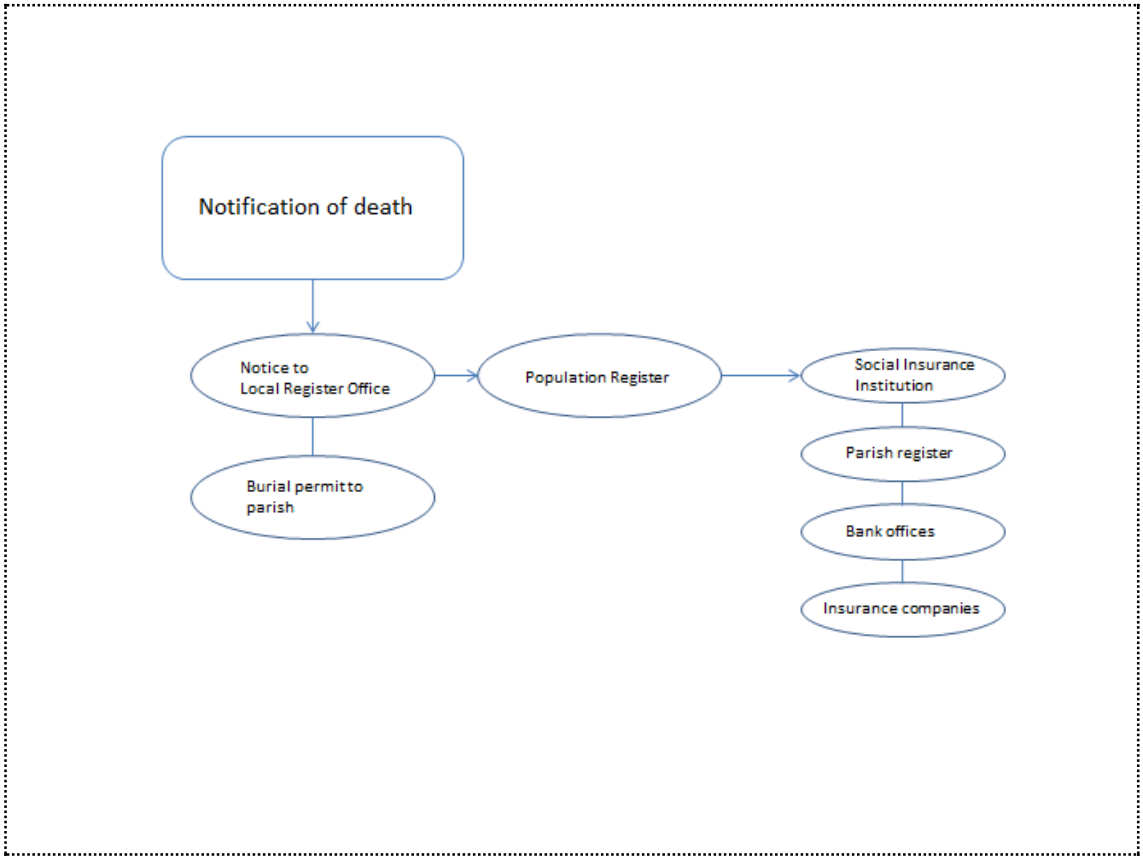


Figure 1. Information flow of notification of death.

All documents dealing with cause-of-death investigations are classified secret. Documents concerning forensic autopsies may not be forwarded to a third party. In accordance with section 15 of the present Act 459/1973, the documents may be released to:

- court of law , public officer or authority
- the next of kin or relatives
- to a person who has requested or agreed post-mortem examinations
- pension insurance companies.

An attending physician, or a medico-legal officer, will issue a death certificate and a burial permit after a cause-of-death investigation. Under the regulations in force at present, death certificates are submitted for verification either to the Regional State Administrative Agency within whose region the deceased was domiciled at the time of death or, in Southern Finland, South-Western Finland, Northern Finland and Lapland to the Department of Forensic Medicine at the University of Helsinki, Turku and Oulu, respectively. The Regional State Administrative Agencies convey the death certificates to the THL medico-

legal officers responsible for verification. In Åland, death certificates are submitted for verification to the Government of Åland (Ålands landskapsregering). (Figure 1)

Renewal of Paper Death Certificates – Why?

The objective of death certificate reforming has been content updates, aim to improve readability and comprehensibility of certificates, standardization of terms used, add-on instructions and the upcoming eCertificate project. As a result all forms have a standard look.

THL has established an internal project organization for supporting this action. The basis for development work has been the close down of Provincial State Offices. From the beginning of 2010, National Institute for Health and Welfare (THL) has been the only competent authority in charge of forensic medicine in Finland.

Renewal of Paper Death Certificates – How?

In accordance with the present Act 459/1973 and the present Decree 948/1973, all cause-of-death investigations, including statistical reporting and archiving of death certificates, must be properly collected and reported. Commission Regulation 328/2011 aims to improve data comparability between member states. Also, the adoption of a common framework in the area of public health and health and safety at work (EC No 1338/2008) is aimed at guaranteeing the systematic production and the quality of data. Due to this regulation, two details have been added into the form of death certificate:

- municipality in which the death took place (Death certificate for a person aged 28 days or over and Death certificate for stillbirths and deaths in the first 28 days of life)
- country of residence of the mother permanently living outside Finland (Death certificate for stillbirths and deaths in the first 28 days of life).

Further changes were made:

- A reference of Provincial State Offices replaced by National Institute for Health and Welfare.
- Section of ”any medical treatment within four weeks prior to death” was removed.
- Latin expressions are no longer needed.
- Place of death health care unit must be clearly defined and specified with identification number.
- Place of death social welfare unit must be clearly defined and specified with identification number.
- Add-on instructions.

New Paper Death Certificate Forms

Ministry of Social Affairs and Health in Finland has approved new death certificate forms. The new forms are effective as of 1 January, 2014. Before, death certificates were to be issued in Finnish, Swedish or Latin. Old forms (Appendix 7) originate from the 1990’s in paper versions only. The new official death certificate forms are available in Finnish and Swedish to better serve their purpose for citizens. Death certificate forms have been translated in English and are available by request.

Type of information	Field	Variables
Data of the deceased	1 + 2	Lastname + Firstname
	3	Country of residence
	4	Personal identity number
	6	Last place of residence
	7	Local register office
Data of the death	5	Time of death
	10	Place of the accident
	11	Activity at the time of the accident
	12	Place of death
Manner of death	9	Manner of death
Postmortem examinations	14	Medical examination of cause of death (no autopsy) Medical examination of cause of death (autopsy) Forensic examination of cause of death (no autopsy) Forensic examination of cause of death (autopsy) Other method of establishing cause of death Place of autopsy Autopsy ID
Cause of death	8	a. Immediated cause of death b. Intermediate cause(s) of death c. Underlying cause of death Aetiology code or external cause Manifestation code and / or main injury ATC code Assumed duration between onset and death
Signatures	15 + 16	Physician's signature + Health care unit ID

Figure 2. Data structure of death certificate.

A data structure of death certificate is shown in Figure 2. A death certificate is summary of the information related to the death and the deceased. Causes of death have been grouped the following way (Figure 3):

Section 8.1. Diseases, injuries, poisonings and external causes of death a. Immediate cause of death. b. Intermediate cause(s) of death. c. Underlying cause of death (must be filled in).

Section 8.2. Other notable diseases, injuries and conditions contributing to death.

Section 9: Manner of death is determined according to the underlying cause of death identified in Section 8.1.c.

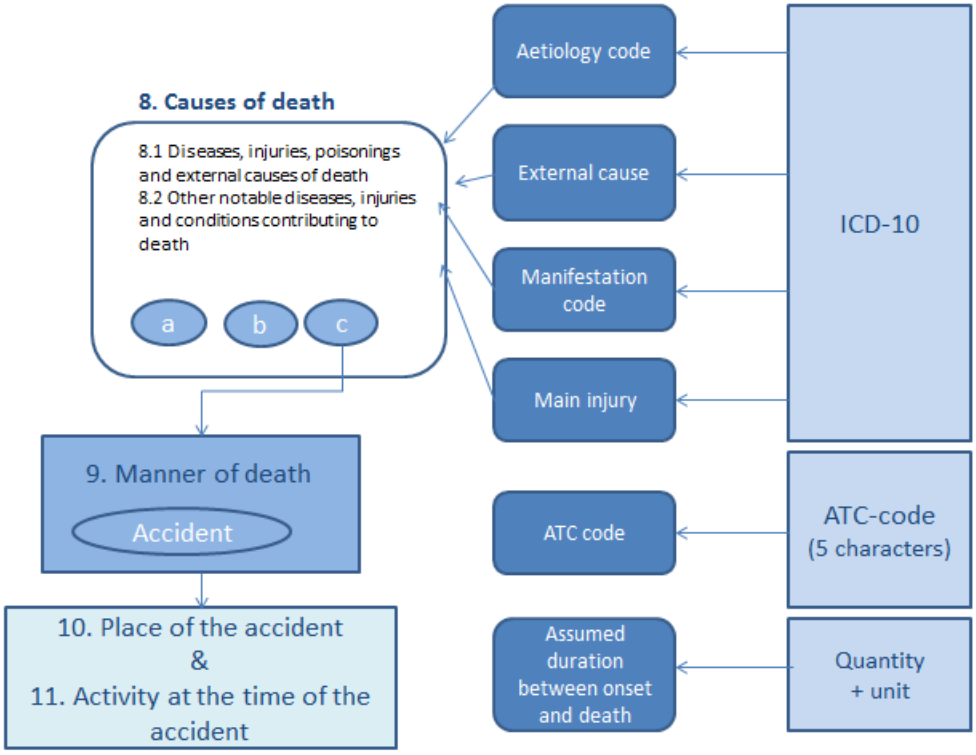


Figure 3. Determining causes of death.

Instructions for filling in death certificates can be found at
http://www.thl.fi/attachments/PALO/Kuolintodistuslomakkeiden_tayttoohjeet.pdf
Instructions are also printed on the forms. Suomalainen tautien kirjaamisen ohjekirja, http://urn.fi/URN:ISBN:978-952-245-511-6 (in Finnish only), includes instructions for issuing a death certificate. Suomalainen tautien kirjaamisen ohjekirja is a manual or handbook of Finnish best practices for disease recognition to be used together with ICD (the International Classification of Diseases) provisions. More detailed instructions and guidelines can be found at the latest ICD-10 provision, the third edition of the Finnish version of the International Statistical Classification of Diseases and Related Health Problems. It is free to be downloaded from the THL CodeServer at http://koodistopalvelu.kanta.fi/codeserver/. As a service provided by legislation, the responsibility for the content of the code sets on the code server lies with THL. The uniform data structures required by the electronic customer and patient information systems of social and health care and key code sets of statistics and register data collection are published on a code server. The Code Service is a part of the electronic National Archive of Health Information (KanTa) system. It maintains nationally uniform data structures and code sets of electronic patient records.

Data structure of Finnish death certificates is to be published according to HL7 framework. These standards define how information is packaged and communicated from one party to another, setting the language, structure and data types required for seamless integration between systems. HL7 standards support clinical practice and management, delivery, and evaluation of health services, and are recognized as the most commonly used standards in the world. However, no processes are defined in a framework.

Feedback Received

THL has collected feedback regarding new death certificate forms by posting a questionnaire on the Institute's website. Some feedback already received:

- Identification number of Place of death health care unit is difficult to find or has changed.
- Online guide for filling-in instructions needed. x)
- ICD-10 marking unclear.
- Need for death certificate forms in English.
- Unclear where to send death certificates.
- Autofill functions needed. x)
- Unclear archiving.
- Forms' tab order is illogical. x)
- Extra fields needed for burial permit.
- Burial permit shouldn't go together with death certificate.
- A Swedish form is not as easy to fill in as the Finnish one. x)
- Lack of information due to changes made in forms.

x) Online forms used in various patient information systems.

Reference forms of death certificates are available in MS Word format for free of charge. Sample forms define layout settings. When integrated with patient information systems, various input validation methods might be available x).

The received feedback will be combined with the results of a user study in objective 2. All feedback will be used as an input for e-certificate development work. A CDA R2 compatible national data structure will be introduced in a deliverable for objective 2.

Process Flows

Medico-legal officers in THL are responsible for verification of death certificates. Every year altogether approximately 50 000 death certificates are verified by THL, all in a paper format.

National Institute for Health and Welfare

The original death certificate issued by the attending physician will be sent to THL. The process flow is shown in Figure 4. In case of discrepancies, the death certificate will be sent back to be corrected.

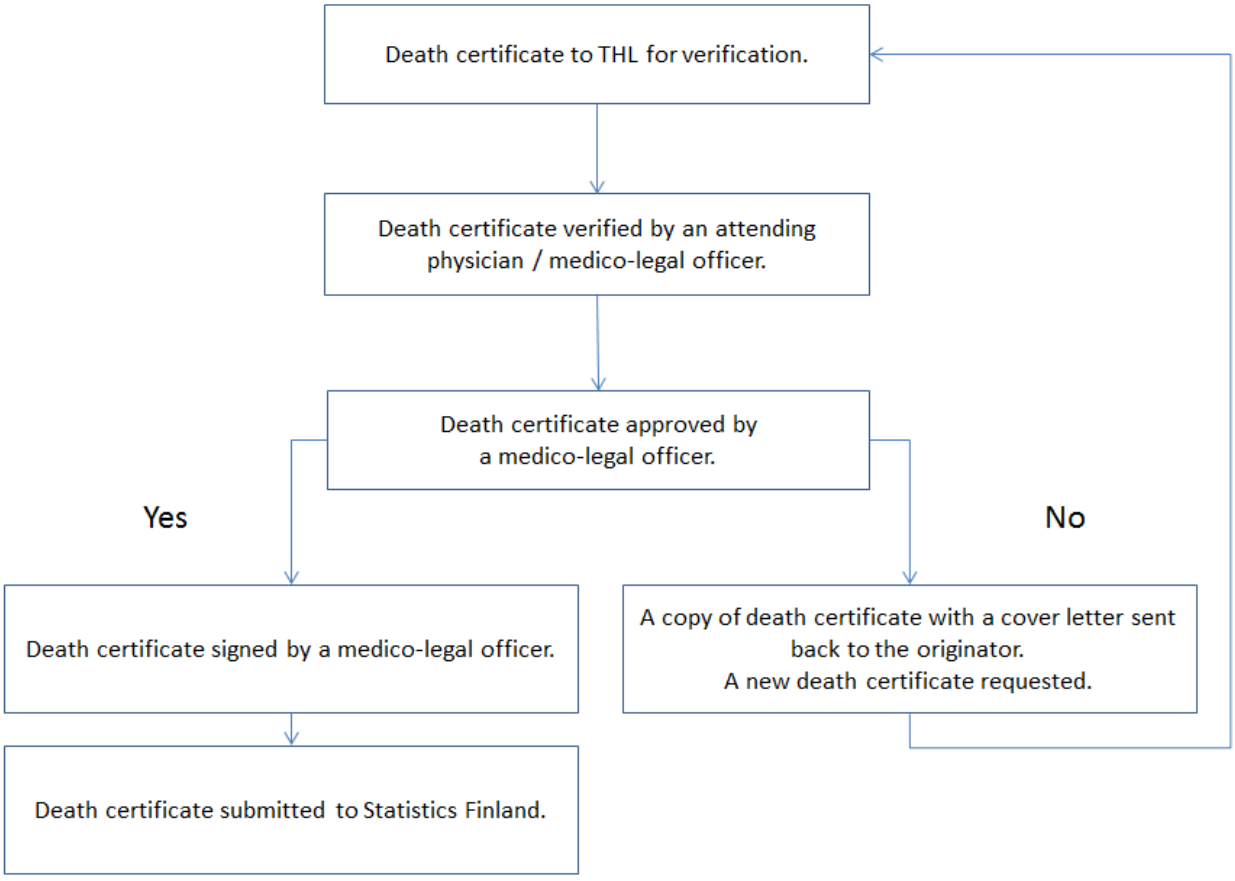


Figure 4. Prosess flow of death certificate verification

THL will submit death certificates further to Statistics Finland for use of CoD (Cause of Death) statistics and archiving. All certificates will be grouped and sorted by the year of death (Figure 5).

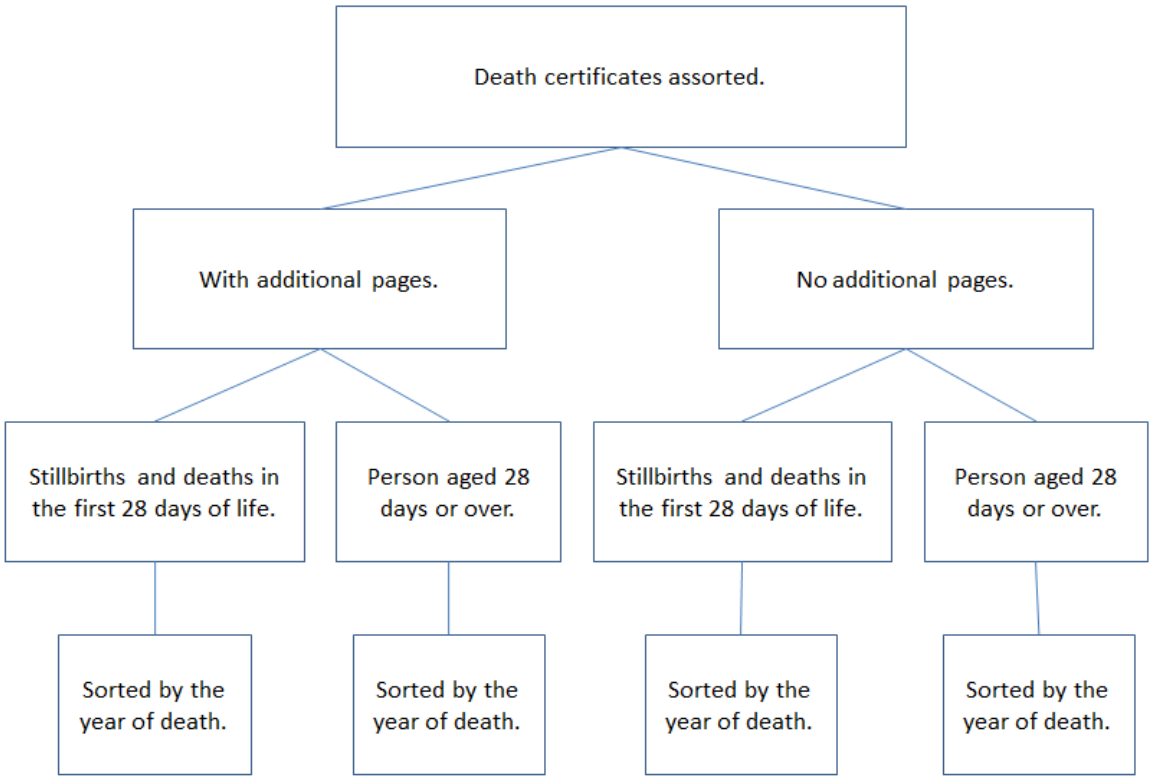


Figure 5. Assortment of death certificates.

Cause of Death Statistics

The basis for the cause of death investigations is the present Act (1973/459). Furthermore, Regulation (EC No 1338/2008 of the European Parliament and of the Council of 16 December 2008 on Community statistics on public health and health and safety at work) regulates the data produced for Community cause of death statistics (Implementation Regulation No 328/2011).

Statistics Finland maintains the Finnish archive of death certificates. The archive contains the death certificates of Finnish residents since 1936. Copies of death certificates and unit level data on causes of death are released from the archives for the purposes specified in the Act on the Inquest into the Cause of Death (459/1973). These purposes cover the releasing of data to 1) the deceased person's next of kin, 2) a pension institution or to the authorities, 3) for scientific research or statistical surveys.

In the CoD statistics statistical information is produced annually on the causes of death of persons permanently resident in Finland. The statistics are compiled on the basis of death certificates on deaths, and the data are supplemented with and verified against data from the Population Information System of the Population Register Centre. Death certificates are archived at Statistics Finland.

Cause of death data are used i.e. in health surveys, in allocating health promotion measures and monitoring health as well as in various medical examinations. By combining the data with other data files it is possible to study, for instance, differences in mortality between different population groups. The basis for an investigation of the cause of death is the information on the death certificate.

The underlying cause of death used in statistics (statistical underlying cause of death) is determined according to the selection and application rules of the International Classification of Diseases (ICD-10) compiled by the World Health Organization (WHO).

Statistics Finland

The causes of death included in the statistics have since 1987 been the underlying cause of death, direct cause, intervening causes and contributing causes. Annual cause of death statistics are compiled according to the statistical underlying cause of death. The statistical underlying cause of death is determined according to the selection and application rules of the International Classification of Diseases (ICD-10) compiled by the World Health Organization (WHO). The underlying cause of death is the disease which has initiated the series of illnesses leading directly to death, or the circumstances connected with an accident or an act of violence which caused the injury or poisoning leading to death.

Statistics Finland scans paper forms of death certificates (including some character recognition), and also makes use of computer-aided coding. Cause of death data is produced annually and they are completed in the end of the following year. Twice a year, Statistics Finland will start dunning of death certificates that are not delivered on time i.e. are missing (Figure 6).

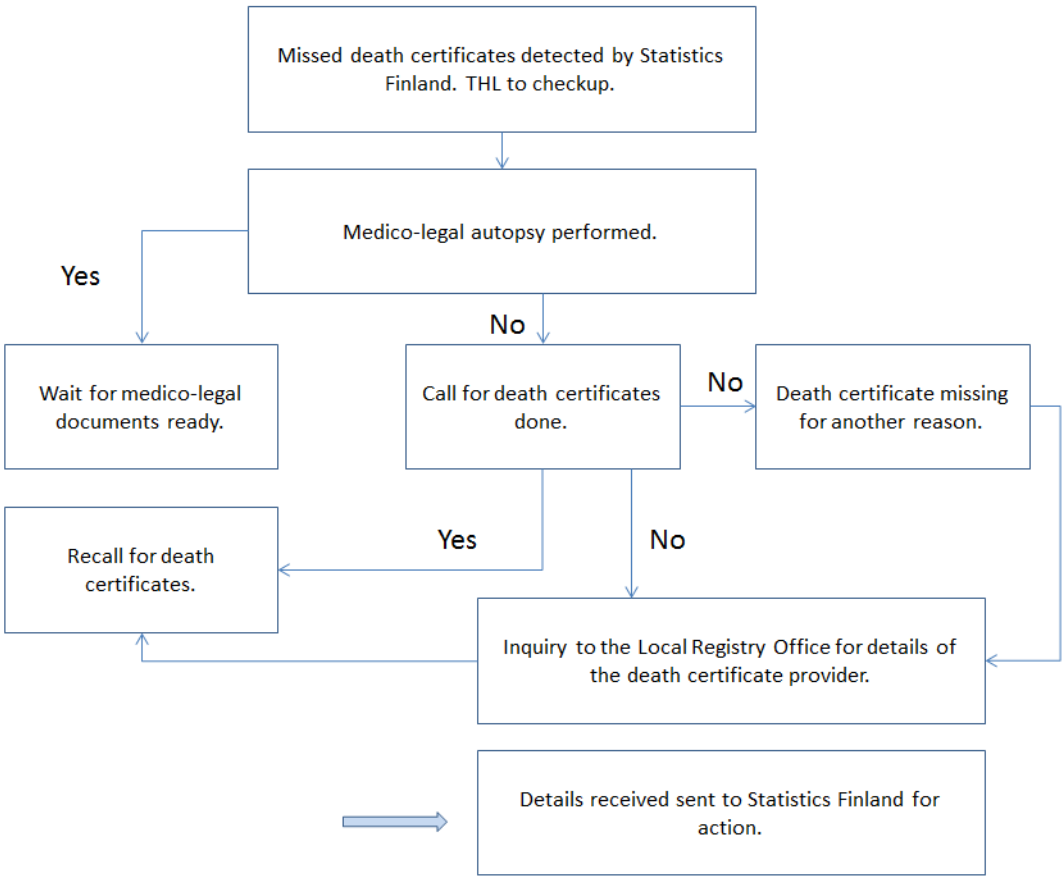


Figure 6. Process flow of death certificate inquiry.

Discussion and Further Actions

In approximately 10 % of all cases, more information is requested from the issuer of the death certificate, because:

- The underlying cause of death is missing.
- Details include epicrisis.
- There is no causal relationship between causes of death.
- Only one cause or code must be listed in each input field.
- Underlying cause of death does not correspond to manner of death.
- Missing signatures.
- In case of accidental death, it has not been reported to the police.

All feedback received must be thoroughly analyzed when further developing an electronic death certificate. A SWOT analysis will help in identifying areas that need special attention and improvement. The current state of action is presented in Figure 7. Process descriptions and specifications are needed to support new e-certificate form development.

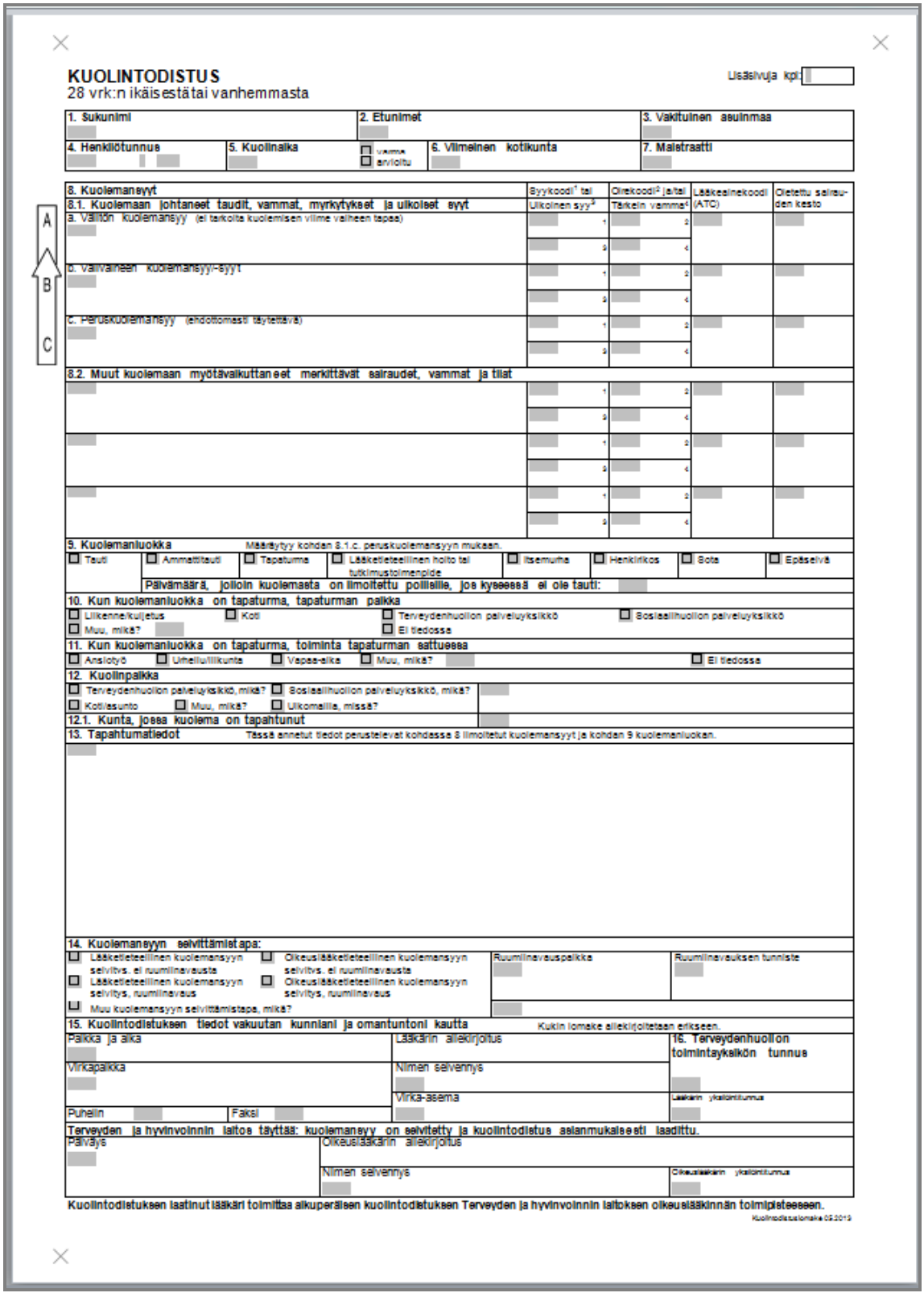
• New death certificate forms already in use. • Process flows defined.	• Delays in reporting data. • Paper-based document management frustrating. • Teamwork between different locations not possible. • Delivery of paper documents difficult. • Too many different patient information systems on the market. • Missing or wrong information on death certificates.
• Uniform data structure to support eCertificate build up.	• Bad working habits.

Figure 7. Current state SWOT analysis.

At this state, s SWOT analysis above is used to evaluate a project venture to justify e-certification development. A promised feasibility study, carried throughout all objective phases, will be thoroughly completed in Objective 4 when "presenting a national plan for how to move to entirely electronic death certification". Therefore, all stakeholders must be acknowledged. Enterprise architecture, a strategic management method that facilitates the activities related to development and change management in an organization, will be of good use. JHS recommendation number 179, published by the Advisory Committee on Information Management in Public Administrations (JUHTA), provides direction and instructions for government officials and authorities. It defines a method, guidelines and models for enterprise architecture planning of public services. A new electronic death certificate project includes form renewal, testing, implementation and cooperation between functions and processes.

Appendices

Appendix 1: A new death certificate in Finnish - Kuolintodistus 28 vrk:n ikäisestä tai vanhemmasta (Death Certificate For a person aged 28 days or over)



KUOLINTODISTUS
28 vrk:n ikäisestä tai vanhemmasta

Lisäsivuja kpl:

1. Sukunimi	2. Etunimet	3. Vakituinen asuinmaa

4. Henkilötunnus	5. Kuolinaika	6. Viimeinen kotikunta	7. Maistraatti
	☐ varma ☐ arvioitu		

8. Kuolemansyyt 8.1. Kuolemaan johtaneet taudit, vammat, myrkytykset ja ulkoiset syyt	Syykoodi[1] tai Ulkoinen syy[3]	Oirekoodi[2] ja/tai Tärkein vamma[4]	Lääkeainekoodi (ATC)	Oletettu sairauden kesto
A. Välitön kuolemansyy (ei tarkoita kuolemisen viime vaiheen tapaa)	1 / 3	2 / 4		
B. Välivaiheen kuolemansyy/-syyt	1 / 3	2 / 4		
C. Peruskuolemansyy (ehdottomasti täytettävä)	1 / 3	2 / 4		
8.2. Muut kuolemaan myötävaikuttaneet merkittävät sairaudet, vammat ja tilat	1 / 3	2 / 4		
	1 / 3	2 / 4		
	1 / 3	2 / 4		

9. Kuolemanluokka Määräytyy kohdan 8.1.c. peruskuolemansyyn mukaan.

☐ Tauti ☐ Ammattitauti ☐ Tapaturma ☐ Lääketieteellinen hoito tai tutkimustoimenpide ☐ Itsemurha ☐ Henkirikos ☐ Sota ☐ Epäselvä

Pälvämäärä, jolloin kuolemasta on ilmoitettu poliisille, jos kyseessä ei ole tauti:

10. Kun kuolemanluokka on tapaturma, tapaturman paikka

☐ Liikenne/kuljetus ☐ Koti ☐ Terveydenhuollon palveluyksikkö ☐ Sosiaalihuollon palveluyksikkö
☐ Muu, mikä? ☐ Ei tiedossa

11. Kun kuolemanluokka on tapaturma, toiminta tapaturman sattuessa

☐ Ansiotyö ☐ Urheilu/liikunta ☐ Vapaa-aika ☐ Muu, mikä? ☐ Ei tiedossa

12. Kuolinpaikka

☐ Terveydenhuollon palveluyksikkö, mikä? ☐ Sosiaalihuollon palveluyksikkö, mikä?
☐ Koti/asunto ☐ Muu, mikä? ☐ Ulkomailla, missä?

12.1. Kunta, jossa kuolema on tapahtunut

13. Tapahtumatiedot Tässä annetut tiedot perustelevat kohdassa 8 ilmoitetut kuolemansyyt ja kohdan 9 kuolemanluokan.

14. Kuolemansyyn selvittämistapa:

☐ Lääketieteellinen kuolemansyyn selvitys, ei ruumiinavausta
☐ Lääketieteellinen kuolemansyyn selvitys, ruumiinavaus
☐ Oikeuslääketieteellinen kuolemansyyn selvitys, ei ruumiinavausta
☐ Oikeuslääketieteellinen kuolemansyyn selvitys, ruumiinavaus
☐ Muu kuolemansyyn selvittämistapa, mikä?

Ruumiinavauspaikka | Ruumiinavauksen tunniste

15. Kuolintodistuksen tiedot vakuutan kunniani ja omantuntoni kautta Kukin lomake allekirjoitetaan erikseen.

Paikka ja aika	Lääkärin allekirjoitus	16. Terveydenhuollon toimintayksikön tunnus
Virkapaikka	Nimen selvennys	
Puhelin / Faksi	Virka-asema	Lääkärin ykkönitunnus

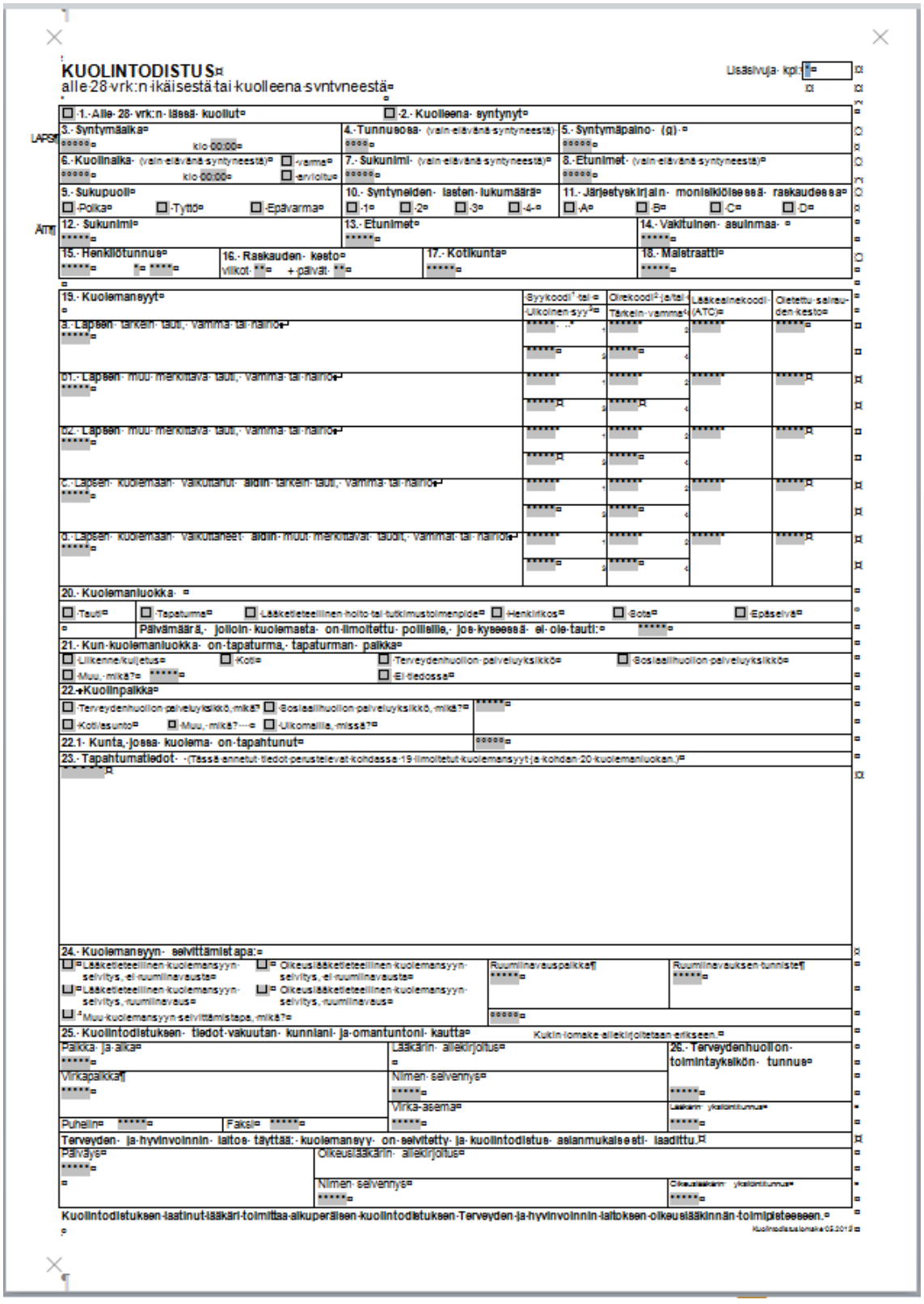
Terveyden ja hyvinvoinnin laitos täyttää: kuolemansyy on selvitetty ja kuolintodistus asianmukaisesti laadittu.

Päiväys	Oikeuslääkärin allekirjoitus	
	Nimen selvennys	Oikeuslääkärin ykkönitunnus

Kuolintodistuksen laatinut lääkäri toimittaa alkuperäisen kuolintodistuksen Terveyden ja hyvinvoinnin laitoksen oikeuslääkinnän toimipisteeseen.

Kuolintodistuslomake 05.2013

Appendix 2: A new death certificate in Finnish - Kuolintodistus alle 28 vrk:n ikäisestä tai kuolleena syntyneestä (Death certificate for stillbirths and deaths in the first 28 days of life)



KUOLINTODISTUS
alle 28 vrk:n ikäisestä tai kuolleena syntyneestä

Lisäsivuja kpl:

☐ 1. Alle 28 vrk:n iässä kuollut ☐ 2. Kuolleena syntynyt

LAPSI

3. Syntymäaika ***** klo 00:00
4. Tunnusosa (vain elävänä syntyneestä) *****
5. Syntymäpaino (g) *****
6. Kuolinaika (vain elävänä syntyneestä) ***** klo 00:00 ☐ varma ☐ arvioitu
7. Sukunimi (vain elävänä syntyneestä) *****
8. Etunimet (vain elävänä syntyneestä) *****
9. Sukupuoli ☐ Poika ☐ Tyttö ☐ Epävarma
10. Syntyneiden lasten lukumäärä ☐ 1 ☐ 2 ☐ 3 ☐ 4
11. Järjestyskirjain monikkoraskaudessa ☐ A ☐ B ☐ C ☐ D

ÄITI

12. Sukunimi *****
13. Etunimet *****
14. Vakituinen asuinmaa *****
15. Henkilötunnus ***** - ****
16. Raskauden kesto viikot: ** + päivät: **
17. Kotikunta *****
18. Maistraatti *****

15. Kuolemansyyt

	Syykoodi[1] tai Ulkoinen syy[2]	Oirekoodi[3] ja/tai Tärkein vamma[4]	Lääkeainekoodi (ATC)	Oletettu seuraus-den kesto
a. Lapsen tärkein tauti, vamma tai häiriö *****	***** 1 / ***** 2	***** 3 / ***** 4	*****	*****
b1. Lapsen muu merkittävä tauti, vamma tai häiriö *****	***** 1 / ***** 2	***** 3 / ***** 4	*****	*****
b2. Lapsen muu merkittävä tauti, vamma tai häiriö *****	***** 1 / ***** 2	***** 3 / ***** 4	*****	*****
c. Lapsen kuolemaan vaikuttanut aidon tärkein tauti, vamma tai häiriö *****	***** 1 / ***** 2	***** 3 / ***** 4	*****	*****
d. Lapsen kuolemaan vaikuttaneet aidon muut merkittävät taudit, vammat tai häiriöt *****	***** 1 / ***** 2	***** 3 / ***** 4	*****	*****

20. Kuolemanluokka

☐ Tauti ☐ Tapaturma ☐ Lääketieteellinen hoito tai tutkimustoimenpide ☐ Henkirikos ☐ Sota ☐ Epäselvä

Päivämäärä, jolloin kuolemasta on ilmoitettu poliisille, jos kyseessä ei ole tauti: *****

21. Kun kuolemanluokka on tapaturma, tapaturman paikka

☐ Liikenne/kuljetus ☐ Koti ☐ Terveydenhuollon palveluyksikkö ☐ Sosiaalihuollon palveluyksikkö
☐ Muu, mikä? ***** ☐ Ei tiedossa

22. Kuolinpaikka

☐ Terveydenhuollon palveluyksikkö, mikä? ☐ Sosiaalihuollon palveluyksikkö, mikä? *****
☐ Koti/asunto ☐ Muu, mikä? ☐ Ulkomailla, missä?

22.1. Kunta, jossa kuolema on tapahtunut *****

23. Tapahtumatiedot (Tässä annetut tiedot perustelevat kohdassa 19 ilmoitetut kuolemansyyt ja kohdan 20 kuolemanluokan.)
*****

24. Kuolemansyyn selvittämistapa:

☐ Lääketieteellinen kuolemansyyn selvitys, ei ruumiinavausta
☐ Oikeuslääketieteellinen kuolemansyyn selvitys, ei ruumiinavausta
☐ Lääketieteellinen kuolemansyyn selvitys, ruumiinavaus
☐ Oikeuslääketieteellinen kuolemansyyn selvitys, ruumiinavaus
☐ Muu kuolemansyyn selvittämistapa, mikä?

Ruumiinavauspaikka ***** Ruumiinavauksen tunniste *****
*****

25. Kuolintodistuksen tiedot vakuutan kunniani ja omantuntoni kautta (Kukin lomake allekirjoitetaan erikseen.)

Palkka ja aika *****
Virkapaikka *****
Puhelin ***** Faksi *****
Lääkärin allekirjoitus
Nimen selvennys *****
Virka-asema *****
26. Terveydenhuollon toimintayksikön tunnus *****
Lääkärin yksilöintitunnus *****

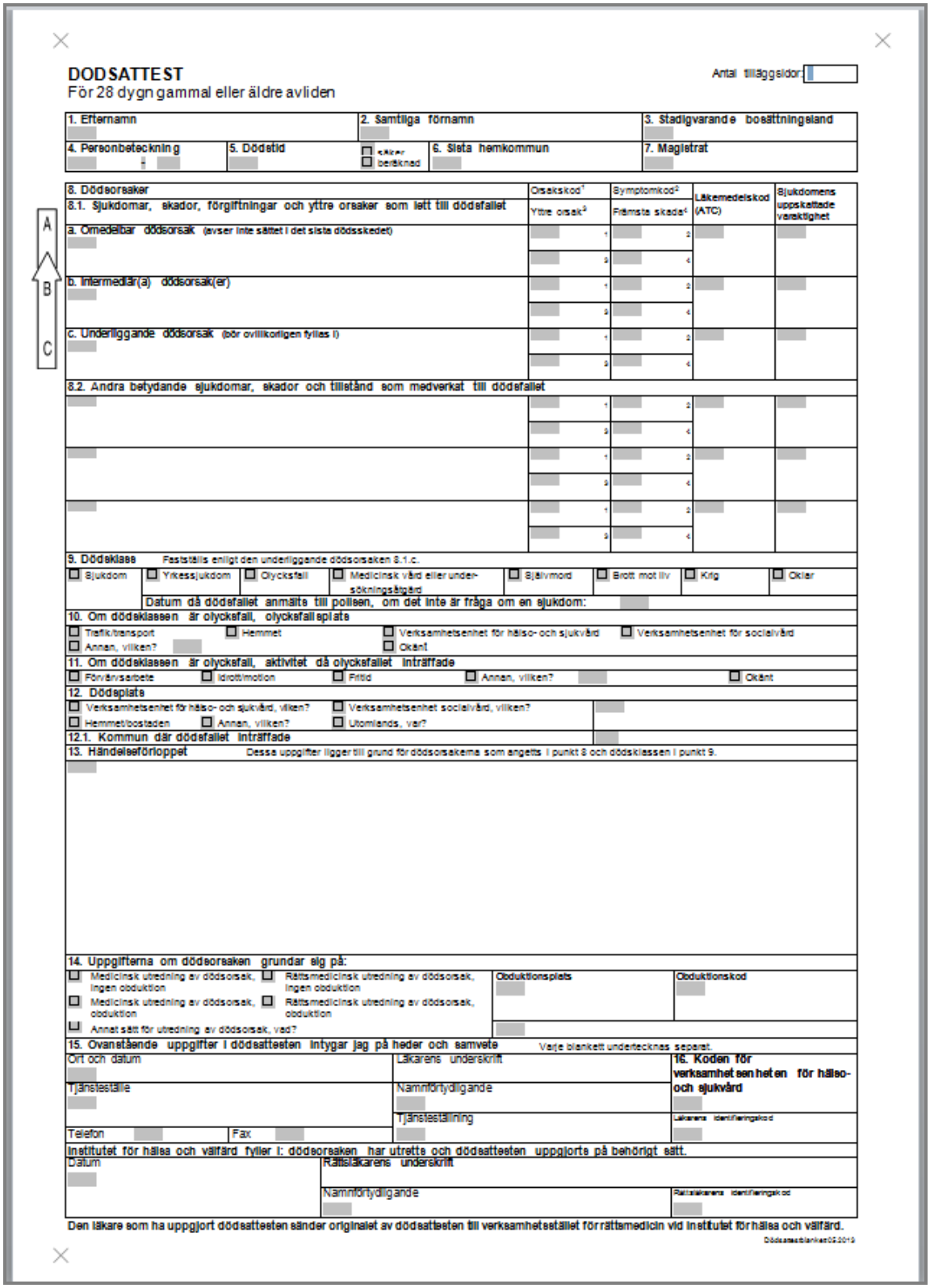
Terveyden ja hyvinvoinnin laitos täyttää: kuolemansyy on selvitetty ja kuolintodistus asianmukaisesti laadittu.

Päiväys *****
Oikeuslääkärin allekirjoitus
Nimen selvennys *****
Oikeuslääkärin yksilöintitunnus *****

Kuolintodistuksen laatinut lääkäri toimittaa alkuperäisen kuolintodistuksen Terveyden ja hyvinvoinnin laitoksen oikeuslääkinnän toimipisteeseen.

Kuolintodistuslomake 05.2013

Appendix 3: A new death certificate in Swedish - Dödsattest för 28 dygn gammal eller äldre (Death Certificate For a person aged 28 days or over)



DODSATTEST
För 28 dygn gammal eller äldre avliden

Antal tilläggsidor:

1. Efternamn	2. Samtliga förnamn	3. Stadigvarande bosättningsland
4. Personbeteckning	5. Dödstid ☐ exakt ☐ beräknad	6. Sista hemkommun / 7. Magistrat

8. Dödsorsaker	Orsakskod[1]	Symptomkod[2]	Läkemedelskod (ATC)	Sjukdomens uppskattade verektighet
8.1. Sjukdomar, skador, förgiftningar och yttre orsaker som lett till dödsfallet	Yttre orsak[3]	Främsta skada[4]		
A a. Omedelbar dödsorsak (avser inte sättet i det sista dödsskedet)	1 / 3	2 / 4		
B b. Intermediär(a) dödsorsak(er)	1 / 3	2 / 4		
C c. Underliggande dödsorsak (bör ovillkorligen fyllas i)	1 / 3	2 / 4		
8.2. Andra betydande sjukdomar, skador och tillstånd som medverkat till dödsfallet				
	1 / 3	2 / 4		
	1 / 3	2 / 4		
	1 / 3	2 / 4		

9. Dödsklass — Fastställs enligt den underliggande dödsorsaken 8.1.c.
☐ Sjukdom ☐ Yrkessjukdom ☐ Olycksfall ☐ Medicinsk vård eller undersökningsåtgärd ☐ Självmord ☐ Brott mot liv ☐ Krig ☐ Okiar

Datum då dödsfallet anmälts till polisen, om det inte är fråga om en sjukdom:

10. Om dödsklassen är olycksfall, olycksfallsplats
☐ Trafik/transport ☐ Hemmet ☐ Verksamhetsenhet för hälso- och sjukvård ☐ Verksamhetsenhet för socialvård
☐ Annan, vilken? ☐ Okänt

11. Om dödsklassen är olycksfall, aktivitet då olycksfallet inträffade
☐ Förvärvsarbete ☐ Idrott/motion ☐ Fritid ☐ Annan, vilken? ☐ Okänt

12. Dödsplats
☐ Verksamhetsenhet för hälso- och sjukvård, vilken? ☐ Verksamhetsenhet socialvård, vilken?
☐ Hemmet/bostaden ☐ Annan, vilken? ☐ Utomlands, var?

12.1. Kommun där dödsfallet inträffade

13. Händelseförloppet — Dessa uppgifter ligger till grund för dödsorsakerna som angetts i punkt 8 och dödsklassen i punkt 9.

14. Uppgifterna om dödsorsaken grundar sig på:
☐ Medicinsk utredning av dödsorsak, ingen obduktion ☐ Rättsmedicinsk utredning av dödsorsak, ingen obduktion
☐ Medicinsk utredning av dödsorsak, obduktion ☐ Rättsmedicinsk utredning av dödsorsak, obduktion
☐ Annat sätt för utredning av dödsorsak, vad?
Obduktionsplats / Obduktionskod

15. Ovanstående uppgifter i dödsattesten intygar jag på heder och samvete — Varje blankett undertecknas separat.

Ort och datum	Läkarens underskrift	16. Koden för verksamhetsenheten för hälso- och sjukvård
Tjänsteställe	Namnförtydligande	
Telefon / Fax	Tjänsteställning	Läkarens identifieringskod

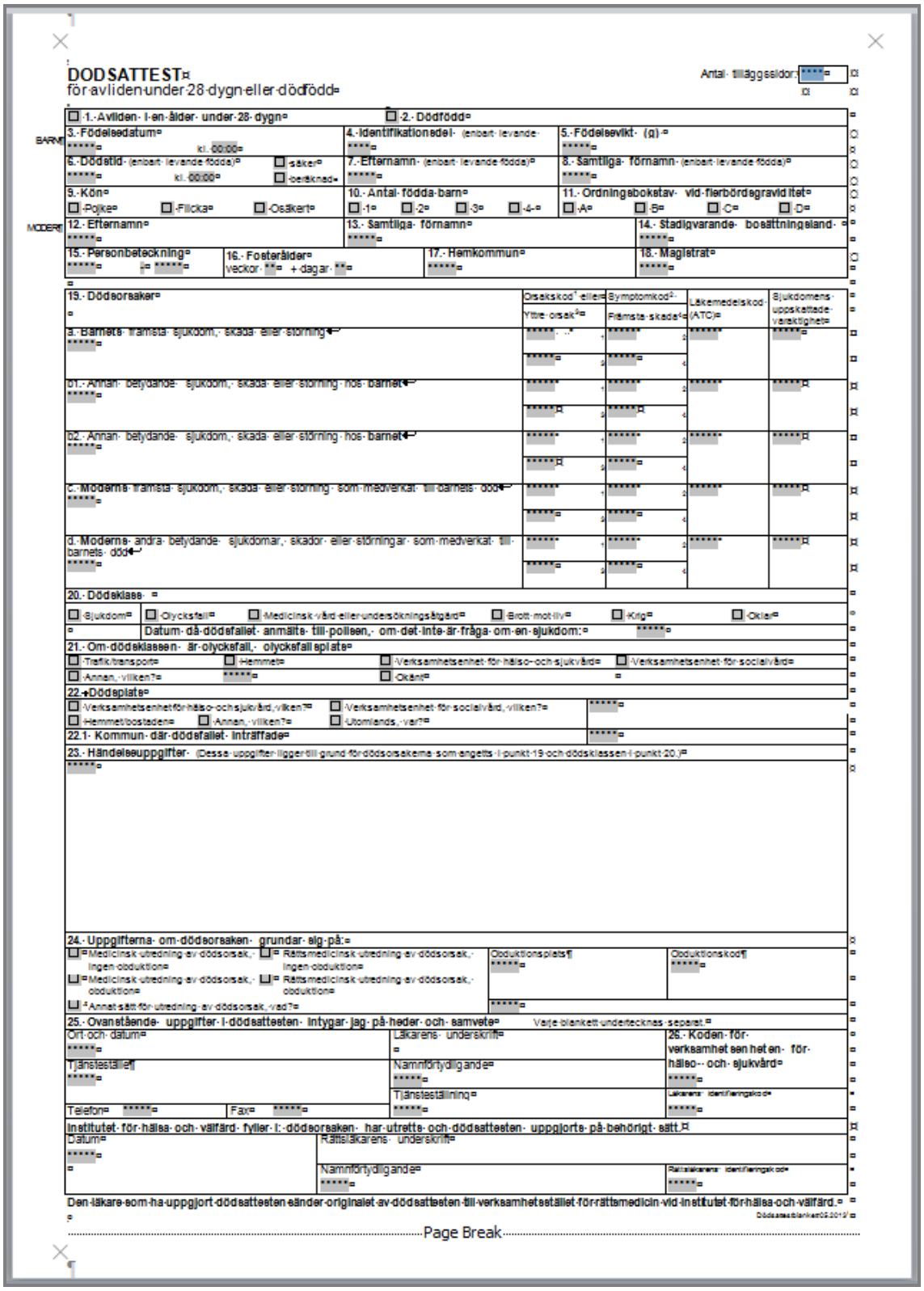
Institutet för hälsa och välfärd fyller i: dödsorsaken har utretts och dödsattesten uppgjorts på behörigt sätt.

Datum	Rättsläkarens underskrift	
	Namnförtydligande	Rättsläkarens identifieringskod

Den läkare som ha uppgjort dödsattesten sänder originalet av dödsattesten till verksamhetsstället för rättsmedicin vid institutet för hälsa och välfärd.

Dödsattestblankett 02.2013

Appendix 4: A new death certificate in Swedish - Dödsattest för avliden under 28 dygn eller dödfödd (Death certificate for stillbirths and deaths in the first 28 days of life)



DODSATTEST
för avliden under 28 dygn eller dödfödd

Antal tilläggssidor:

BARNET

1. Avliden i en ålder under 28 dygn ☐ 2. Dödfödd

3. Födelsedatum ***** kl. 00:00

4. Identifikationsdel (enbart levande födda) *****

5. Födelsevikt (g) *****

6. Dödstid (enbart levande födda) ***** kl. 00:00 ☐ säker ☐ beräknad

7. Efternamn (enbart levande födda) *****

8. Samtliga förnamn (enbart levande födda) *****

9. Kön ☐ Pojke ☐ Flicka ☐ Osäkert

10. Antal födda barn ☐ 1 ☐ 2 ☐ 3 ☐ 4-

11. Ordningsbokstav vid flerbördesgraviditet ☐ A ☐ B ☐ C ☐ D

MODERN

12. Efternamn *****

13. Samtliga förnamn *****

14. Stadigvarande bosättningsland *****

15. Personbeteckning ***** - *****

16. Fosterålder veckor ** + dagar **

17. Hemkommun *****

18. Magistrat *****

19. Dödsorsaker

	Orsakskod[1] eller Yttre orsak[3]	Symptomkod[2] Främsta skada[4]	Läkemedelskod (ATC)	Sjukdomens uppskattade varaktighet
a. Barnets främsta sjukdom, skada eller störning *****	***** / *****	***** / *****	*****	*****
b1. Annan betydande sjukdom, skada eller störning hos barnet *****	***** / *****	***** / *****	*****	*****
b2. Annan betydande sjukdom, skada eller störning hos barnet *****	***** / *****	***** / *****	*****	*****
c. Moderns främsta sjukdom, skada eller störning som medverkat till barnets död *****	***** / *****	***** / *****	*****	*****
d. Moderns andra betydande sjukdomar, skador eller störningar som medverkat till barnets död *****	***** / *****	***** / *****	*****	*****

20. Dödsklass

☐ Sjukdom ☐ Olycksfall ☐ Medicinsk vård eller undersökningsåtgärd ☐ Brott mot liv ☐ Krig ☐ Okänt

Datum då dödsfallet anmälts till polisen, om det inte är fråga om en sjukdom: *****

21. Om dödsklassen är olycksfall, olycksfallsplats

☐ Trafik/transport ☐ Hemmet ☐ Verksamhetsenhet för hälso- och sjukvård ☐ Verksamhetsenhet för socialvård

☐ Annan, vilken? ***** ☐ Okänt

22. Dödsplats

☐ Verksamhetsenhet för hälso- och sjukvård, vilken? ☐ Verksamhetsenhet för socialvård, vilken? *****

☐ Hemmet/bostaden ☐ Annan, vilken? ☐ Utomlands, var?

22.1 Kommun där dödsfallet inträffade *****

23. Händelseuppgifter (Dessa uppgifter ligger till grund för dödsorsakerna som angetts i punkt 19 och dödsklassen i punkt 20.) *****

24. Uppgifterna om dödsorsaken grundar sig på:

☐ [5] Medicinsk utredning av dödsorsak, ingen obduktion ☐ [5] Rättsmedicinsk utredning av dödsorsak, ingen obduktion

☐ [5] Medicinsk utredning av dödsorsak, obduktion ☐ [5] Rättsmedicinsk utredning av dödsorsak, obduktion

☐ [4] Annat sätt för utredning av dödsorsak, vad? *****

Obduktionsplats ***** Obduktionskod *****

25. Ovanstående uppgifter i dödsattesten intygar jag på heder och samvete Varje blankett undertecknas separat

Ort och datum *****

Läkarens underskrift

Namnförtydligande *****

Tjänsteställe ***** Telefon ***** Fax *****

Tjänsteställning *****

26. Koden för verksamhetsenheten för hälso- och sjukvård *****

Läkarens identifieringskod *****

Institutet för hälsa och välfärd fyller i: dödsorsaken har utretts och dödsattesten upprättats på behörigt sätt

Datum *****

Rättsläkarens underskrift

Namnförtydligande *****

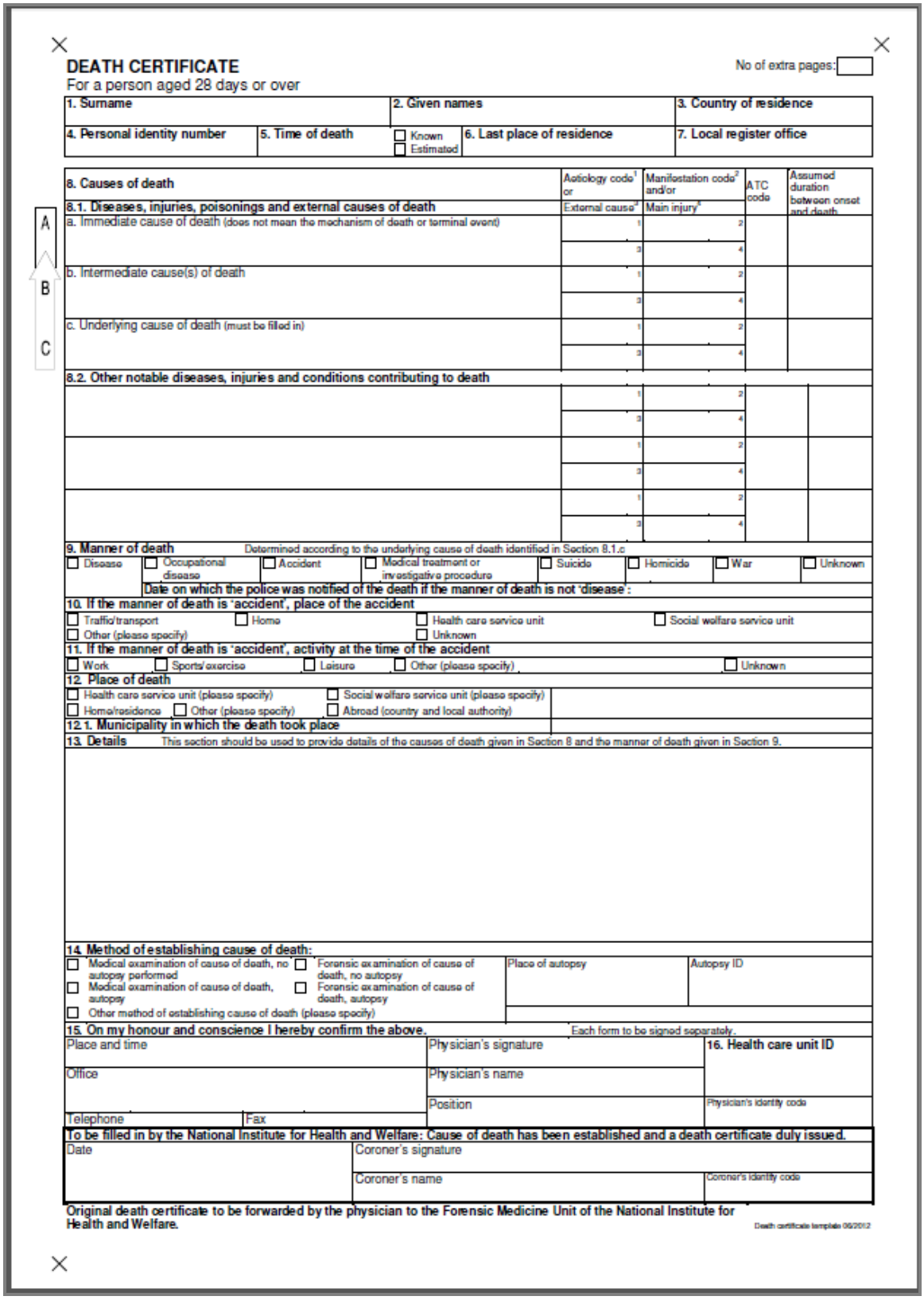
Rättsläkarens identifieringskod *****

Den läkare som har uppgjort dödsattesten sänder originalet av dödsattesten till verksamhetsstället för rättsmedicin vid Institutet för hälsa och välfärd.

Dödsattestblankett 02.2013

Page Break

Appendix 5: Death Certificate For a person aged 28 days or over – English translation



DEATH CERTIFICATE

For a person aged 28 days or over

No of extra pages:

1. Surname	2. Given names	3. Country of residence
4. Personal identity number	5. Time of death ☐ Known ☐ Estimated	6. Last place of residence / 7. Local register office

8. Causes of death	Aetiology code[1] or External cause[4]	Manifestation code[2] and/or Main injury[3]	ATC code	Assumed duration between onset and death
8.1. Diseases, injuries, poisonings and external causes of death				
A a. Immediate cause of death (does not mean the mechanism of death or terminal event)	1 / 3	2 / 4		
B b. Intermediate cause(s) of death	1 / 3	2 / 4		
C c. Underlying cause of death (must be filled in)	1 / 3	2 / 4		
8.2. Other notable diseases, injuries and conditions contributing to death				
	1 / 3	2 / 4		
	1 / 3	2 / 4		
	1 / 3	2 / 4		

9. Manner of death Determined according to the underlying cause of death identified in Section 8.1.c

☐ Disease ☐ Occupational disease ☐ Accident ☐ Medical treatment or investigative procedure ☐ Suicide ☐ Homicide ☐ War ☐ Unknown

Date on which the police was notified of the death if the manner of death is not 'disease':

10. If the manner of death is 'accident', place of the accident

☐ Traffic/transport ☐ Home ☐ Health care service unit ☐ Social welfare service unit
☐ Other (please specify) ☐ Unknown

11. If the manner of death is 'accident', activity at the time of the accident

☐ Work ☐ Sports/exercise ☐ Leisure ☐ Other (please specify) ☐ Unknown

12. Place of death

☐ Health care service unit (please specify) ☐ Social welfare service unit (please specify)
☐ Home/residence ☐ Other (please specify) ☐ Abroad (country and local authority)

12.1. Municipality in which the death took place

13. Details This section should be used to provide details of the causes of death given in Section 8 and the manner of death given in Section 9.

14. Method of establishing cause of death:

☐ Medical examination of cause of death, no autopsy performed ☐ Forensic examination of cause of death, no autopsy
☐ Medical examination of cause of death, autopsy ☐ Forensic examination of cause of death, autopsy
☐ Other method of establishing cause of death (please specify)

Place of autopsy / Autopsy ID

15. On my honour and conscience I hereby confirm the above. Each form to be signed separately.

Place and time	Physician's signature	16. Health care unit ID
Office	Physician's name	
	Position	Physician's identity code
Telephone / Fax		

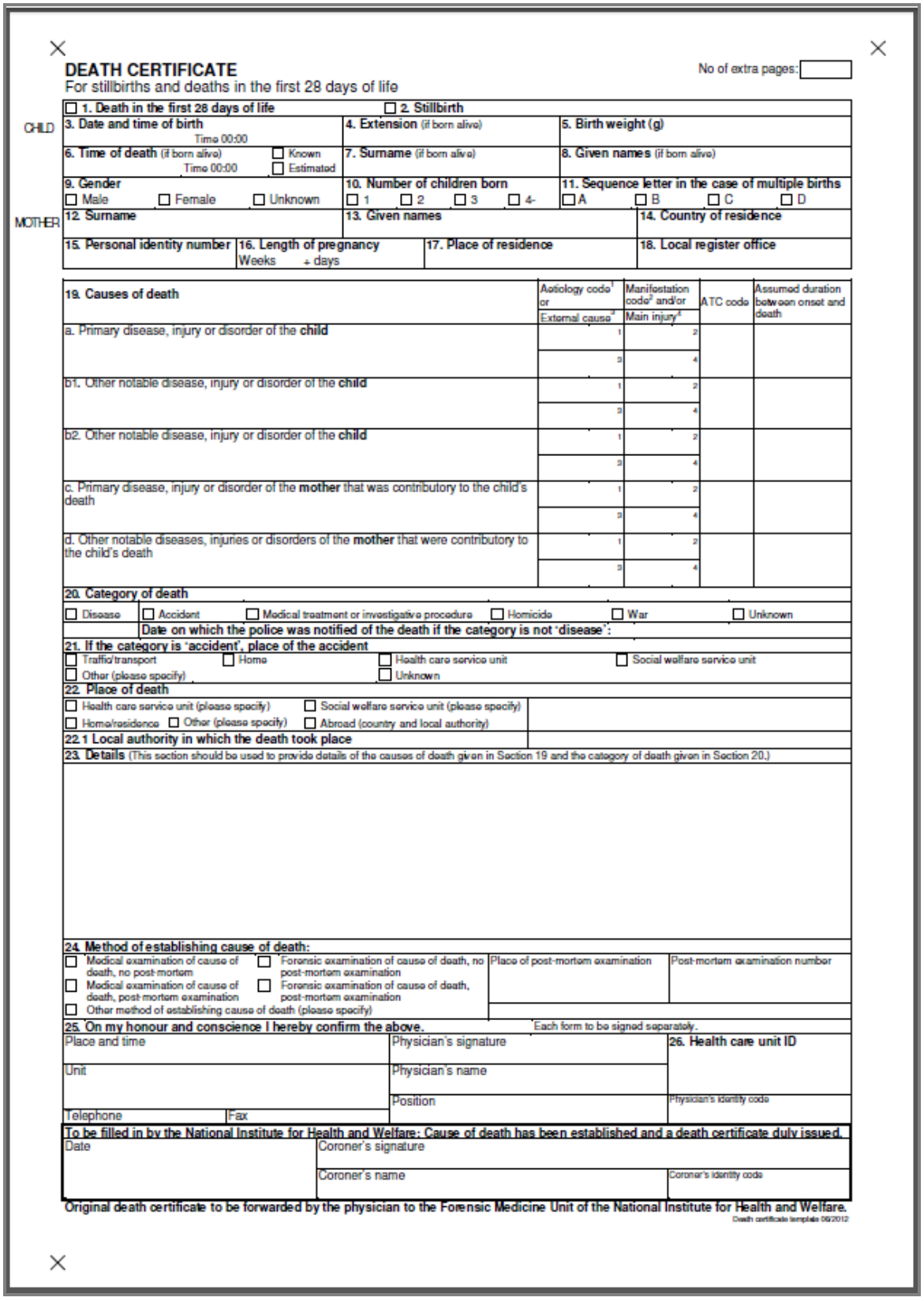
To be filled in by the National Institute for Health and Welfare: Cause of death has been established and a death certificate duly issued.

Date	Coroner's signature	
	Coroner's name	Coroner's identity code

Original death certificate to be forwarded by the physician to the Forensic Medicine Unit of the National Institute for Health and Welfare.

Death certificate template 06/2012

Appendix 6: Death certificate for stillbirths and deaths in the first 28 days of life – English translation



DEATH CERTIFICATE
For stillbirths and deaths in the first 28 days of life

No of extra pages: ☐

CHILD

☐ 1. Death in the first 28 days of life ☐ 2. Stillbirth

3. Date and time of birth Time 00:00	4. Extension (if born alive)	5. Birth weight (g)
6. Time of death (if born alive) Time 00:00 ☐ Known ☐ Estimated	7. Surname (if born alive)	8. Given names (if born alive)
9. Gender ☐ Male ☐ Female ☐ Unknown	10. Number of children born ☐ 1 ☐ 2 ☐ 3 ☐ 4-	11. Sequence letter in the case of multiple births ☐ A ☐ B ☐ C ☐ D

MOTHER

12. Surname	13. Given names	14. Country of residence
15. Personal identity number	16. Length of pregnancy Weeks + days	17. Place of residence / 18. Local register office

19. Causes of death	Aetiology code[1] or External cause[3]	Manifestation code[2] and/or Main injury[4]	ATC code	Assumed duration between onset and death
a. Primary disease, injury or disorder of the **child**	1 / 3	2 / 4		
b1. Other notable disease, injury or disorder of the **child**	1 / 3	2 / 4		
b2. Other notable disease, injury or disorder of the **child**	1 / 3	2 / 4		
c. Primary disease, injury or disorder of the **mother** that was contributory to the child's death	1 / 3	2 / 4		
d. Other notable diseases, injuries or disorders of the **mother** that were contributory to the child's death	1 / 3	2 / 4		

20. Category of death

☐ Disease ☐ Accident ☐ Medical treatment or investigative procedure ☐ Homicide ☐ War ☐ Unknown

Date on which the police was notified of the death if the category is not 'disease':

21. If the category is 'accident', place of the accident

☐ Traffic/transport ☐ Home ☐ Health care service unit ☐ Social welfare service unit
☐ Other (please specify) ☐ Unknown

22. Place of death

☐ Health care service unit (please specify) ☐ Social welfare service unit (please specify)
☐ Home/residence ☐ Other (please specify) ☐ Abroad (country and local authority)

22.1 Local authority in which the death took place

23. Details (This section should be used to provide details of the causes of death given in Section 19 and the category of death given in Section 20.)

24. Method of establishing cause of death:

☐ Medical examination of cause of death, no post-mortem
☐ Medical examination of cause of death, post-mortem examination
☐ Other method of establishing cause of death (please specify)
☐ Forensic examination of cause of death, no post-mortem examination
☐ Forensic examination of cause of death, post-mortem examination

Place of post-mortem examination | Post-mortem examination number

25. On my honour and conscience I hereby confirm the above. Each form to be signed separately.

Place and time	Physician's signature	26. Health care unit ID
Unit	Physician's name	
	Position	Physician's identity code
Telephone / Fax		

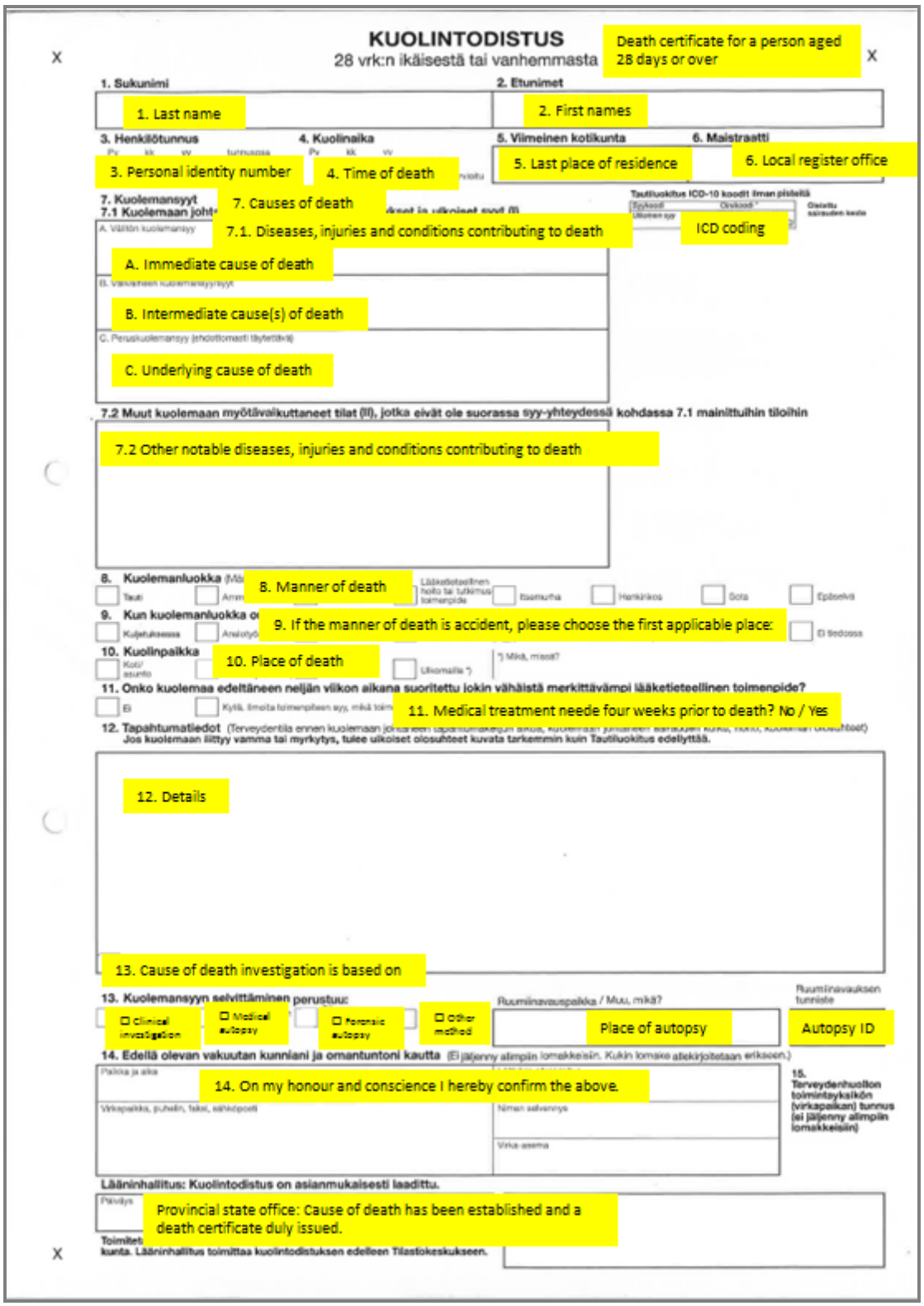
To be filled in by the National Institute for Health and Welfare: Cause of death has been established and a death certificate duly issued.

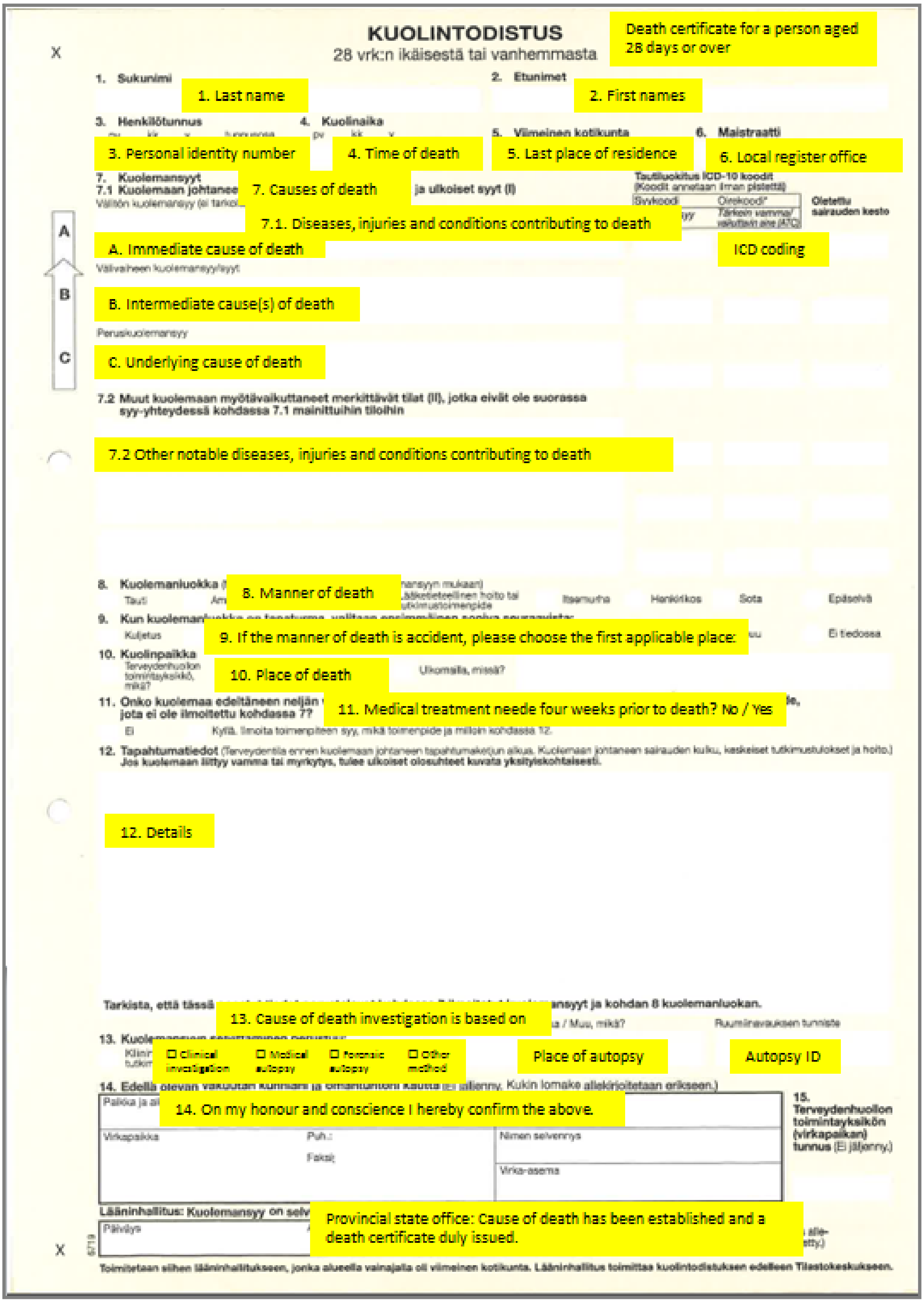
Date	Coroner's signature	
	Coroner's name	Coroner's identity code

Original death certificate to be forwarded by the physician to the Forensic Medicine Unit of the National Institute for Health and Welfare.

Death certificate template 06/2012

Appendix 7: Old Style Death Certificates (3 pcs.)

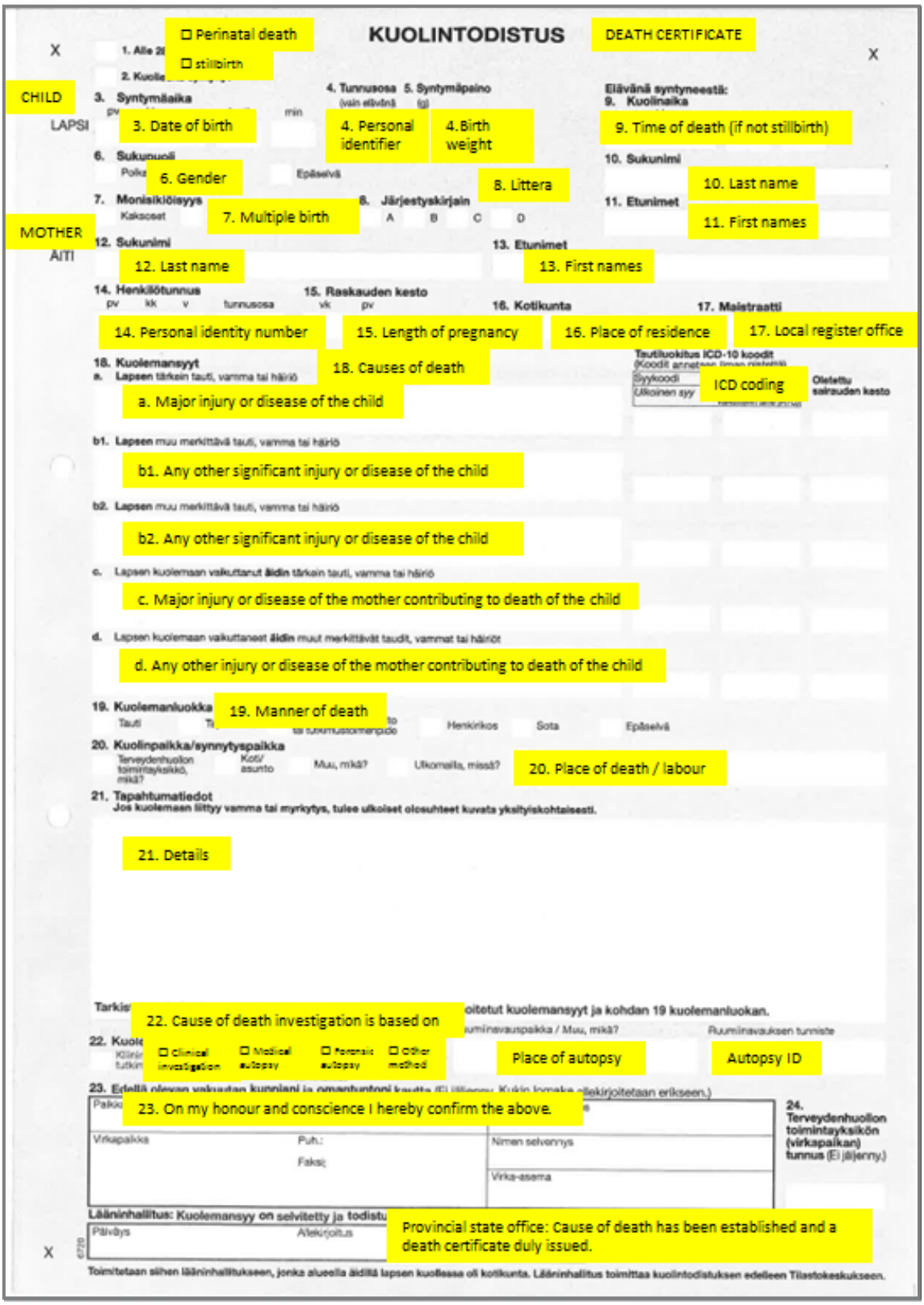




KUOLINTODISTUS
28 vrk:n ikäisestä tai vanhemmasta

Death certificate for a person aged 28 days or over

1. Sukunimi
1. Last name
2. Etunimet
2. First names
3. Henkilötunnus
3. Personal identity number
4. Kuolinaika
4. Time of death
5. Viimeinen kotikunta
5. Last place of residence
6. Maistraatti
6. Local register office
7. Kuolemansyyt
7.1 Kuolemaan johtaneet ... ja ulkoiset syyt (I)
7. Causes of death
7.1. Diseases, injuries and conditions contributing to death
Tautiluokitus ICD-10 koodit
Oletettu sairauden kesto
A
A. Immediate cause of death
ICD coding
Välivaiheen kuolemansyy/syyt
B
B. Intermediate cause(s) of death
Peruskuolemansyy
C
C. Underlying cause of death
7.2 Muut kuolemaan myötävaikuttaneet merkittävät tilat (II), jotka eivät ole suorassa syy-yhteydessä kohdassa 7.1 mainittuihin tiloihin
7.2 Other notable diseases, injuries and conditions contributing to death
8. Kuolemanluokka
8. Manner of death
Tauti / Itsemurha / Henkirikos / Sota / Epäselvä
9. If the manner of death is accident, please choose the first applicable place:
Kuljetus / Ei tiedossa
10. Kuolinpaikka
10. Place of death
Ulkomailla, missä?
11. Onko kuolemaa edeltäneen neljän ... jota ei ole ilmoitettu kohdassa 7?
11. Medical treatment neede four weeks prior to death? No / Yes
Ei / Kyllä. Ilmoita toimenpiteen syy, mikä toimenpide ja milloin kohdassa 12.
12. Tapahtumatiedot (Terveydentila ennen kuolemaan johtaneen tapahtumaketjun alkua. Kuolemaan johtaneen sairauden kulku, keskeiset tutkimustulokset ja hoito.) Jos kuolemaan liittyy vamma tai myrkytys, tulee ulkoiset olosuhteet kuvata yksityiskohtaisesti.
12. Details
Tarkista, että tässä ... kuolemansyyt ja kohdan 8 kuolemanluokan.
13. Cause of death investigation is based on
13. Kuolemansyyn selvittäminen perustuu
☐ Clinical investigation ☐ Medical autopsy ☐ Forensic autopsy ☐ Other method
Place of autopsy
Ruumiinavauksen tunniste
Autopsy ID
14. Edellä olevan vakuutan kunniani ja omantuntoni kautta ... Kukin lomake allekirjoitetaan erikseen.)
14. On my honour and conscience I hereby confirm the above.
Paikka ja aika / Virkapaikka / Puh.: / Faksi: / Nimen selvennys / Virka-asema
15. Terveydenhuollon toimintayksikön (virkapaikan) tunnus (Ei jäljennöksiä.)
Lääninhallitus: Kuolemansyy on selvitetty ...
Päiväys
Provincial state office: Cause of death has been established and a death certificate duly issued.
Toimitetaan siihen lääninhallitukseen, jonka alueella vainajalla oli viimeinen kotikunta. Lääninhallitus toimittaa kuolintodistuksen edelleen Tilastokeskukseen.


KUOLINTODISTUS
DEATH CERTIFICATE
☐ Perinatal death
☐ stillbirth
CHILD
LAPSI
3. Date of birth
4. Personal identifier
4. Birth weight
9. Time of death (if not stillbirth)
6. Gender
8. Littera
10. Last name
11. First names
7. Multiple birth
MOTHER
ÄITI
12. Last name
13. First names
14. Personal identity number
15. Length of pregnancy
16. Place of residence
17. Local register office
18. Causes of death
ICD coding
a. Major injury or disease of the child
b1. Any other significant injury or disease of the child
b2. Any other significant injury or disease of the child
c. Major injury or disease of the mother contributing to death of the child
d. Any other injury or disease of the mother contributing to death of the child
19. Manner of death
20. Place of death / labour
21. Details
22. Cause of death investigation is based on
Place of autopsy
Autopsy ID
23. On my honour and conscience I hereby confirm the above.
Provincial state office: Cause of death has been established and a death certificate duly issued.

Pia Korpisaari

Objective 2: Assessment among Patient Record Systems Users in Finland

Deliverable for Objective 2
January 2015

Overview

Purpose of Mortality Data

The medical certificate of cause-of-death (CoD) is the source of mortality statistics that set up the basis of the oldest and the most extensive public health surveillance systems. Death certificates provide information on the characteristics of people who die and important information on causes of death. [1] In Finland, a notification of death will automatically be registered in population information systems and by others in authority. A death certificate will be issued after all cause-of-death investigations are done and ready. After each death, the physician concerned must determine the cause and manner of death, complete the death certificate, and send its medical portion to the cause-of-death statistics authority, in Finland via THL (National Institute for Health and Welfare). At THL, the medico-legal officer examines the certificate, possibly asks the certifier for additional information on the cause(s), manner or circumstances of death, and sends the death certificate, with his / her (possible) statement and signature, further to Statistics Finland.

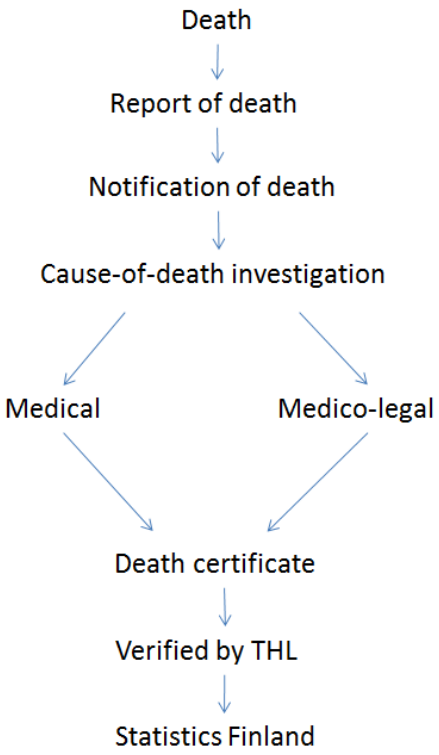


Figure 1. A generalized scheme from death to statistical data

This report is a moderate assessment of an overall death certificate quality among patient record systems users in Finland. The aim of this assessment was to find out any details of inconvenience in quality or causing delays in delivery. The lessons learnt will be introduced as a framework for the e-certificate project.

Social Welfare and Health Care Reform in Finland

In a new, yet not deployed, social and health care model of Finland, the arrangement and provision of health and social care services will be separated. The responsibility for organizing the services will rest with five social welfare and health care regions (Figure 2). The joint municipal authority in the social welfare and health care region will be responsible for ensuring everyone entitled to services also to receive the services they need. It forms the core of provision of local services. Services may be centralized only for specific reasons due to accessibility, quality or cost-effectiveness. Different methods may be used to provide services. [2]

A social welfare and health care region is a joint municipal authority. Each municipality will belong to one of the five regions. The most common patient record systems of these five regions are Effica, Uranus, Esko and Mediatri (Figure 2). [3]

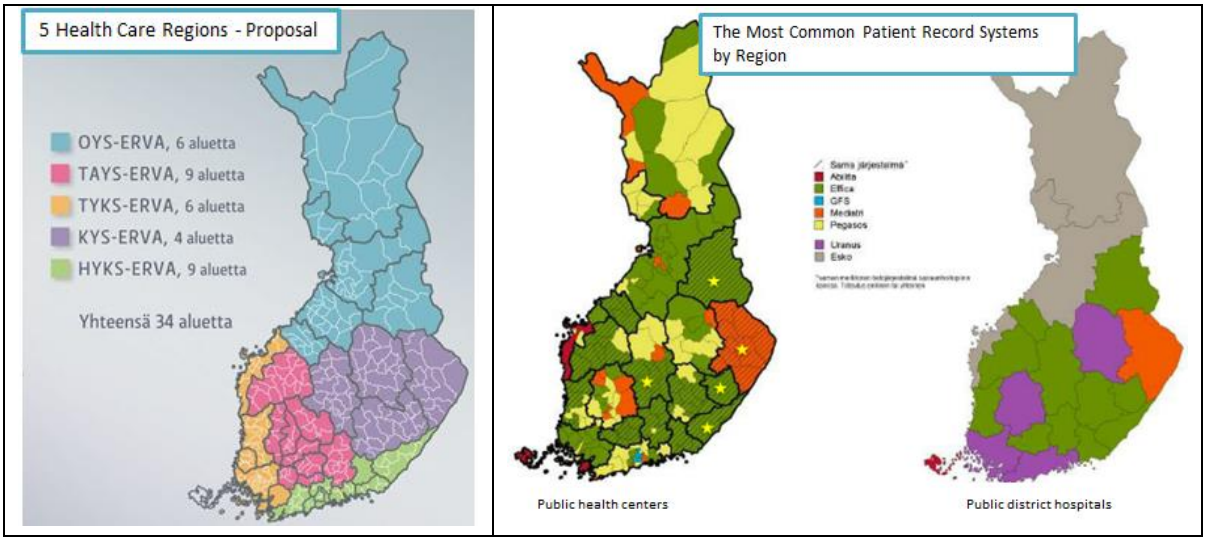


Figure 2. Patient record systems by area in Finland [4] [5]

Patient Information Systems

Patient Information Systems aka Patient Record Systems are designed to improve access to patient information through a central electronic information system. Traditionally all information is maintained in a paper format in internal systems. Electronic systems help to collect and save all patient related data in one place.

In Finland, special and primary health care units in both public and private sectors have tens of different patient information systems in use. Every service provider had its own patient record system without interoperability with each other. The most common systems, listed by their brand names, are Abilita / Medcix, Doctorex, Effica, Finstar, HealthNet, Esko, Mediatri, Miranda, Pegasos, Praxis, ProSalus, ProVita plus, Acute, Doctor, Medicus, MediPro, MediTree, ProVirex and SoftMedic [6].

Using of patient information systems aims to increase effectivity, safety of patients and customer satisfaction in an organization. They should enable information sharing between all stakeholders by supporting and guiding doctors, nurses and rest of the staff. A flexible system will adapt to changing needs of all stakeholders. In Finland the use of patient information systems is not enforced, but highly encouraged, by the state.

The national data system for healthcare services, pharmacies and citizens in Finland is called KanTa (The National Archive of Health Information). Services include electronic prescriptions, Pharmaceutical Database, My KanTa pages, and Patient Data Repository. Services are deployed in phases throughout Finland. In future, patient information entered in a structured form with shared code products could also be used for the automation of functions such as statistical reporting. [7] Patient Data Repository provided by

KanTa services cannot be utilized for archiving documents of medico-legal autopsies in Finland. Those documents are not classified as patient records and thus, they are not to be archived in the Patient Data Repository.

HL7, CDA R2, WHO ICD-10

Some of the existing standards are to achieve interoperability between software applications in healthcare. The interoperability of healthcare information system is an important issue in medical informatics field. It is important to increase the life expectancy, reduce medical errors and provide more medical information for medical personal.

Health Level Seven International (HL7) is a standards developing organization. HL7 and related standards provide a framework for the exchange, integration, sharing, and retrieval of electronic health information. These standards define how information is packaged and communicated from one party to another, setting the language, structure and data types required for seamless integration between systems. HL7 standards support clinical practice and the management, delivery and evaluation of health services, and are recognized as the most commonly used in the world. [8] [9]

HL7 Finland is an open association for organizations that are interested in systems integration issues and solutions in healthcare and social services. It was founded in 1995 as the 5th International Affiliate of HL7. [10]

The Clinical Document Architecture (CDA) is a markup standard developed by the HL7 organization to define the structure of clinical documents such as discharge summaries and progress notes. These documents can include text, images and other types of multimedia. The CDA is based on XML, the Extensible Markup Language. To represent health concepts, the CDA uses HL7's Reference Information Model, which aims to put data in a clinical or administrative context and to express how pieces of data are connected, and coding systems. By setting standards for information exchange, the CDA is a step toward the goal of ensuring that patient records can be created and read by any electronic medical record (EMR) or electronic health record (EHR) software system. [11]

The International Classification of Diseases (ICD) is the standard diagnostic tool for epidemiology, health management and clinical purposes. This includes the analysis of the general health situation of population groups. It is used to monitor the incidence and prevalence of diseases and other health problems, providing a picture of the general health situation of countries and populations. ICD-10 was endorsed by the Forty-third World Health Assembly in May 1990 and came into use in WHO Member States as from 1994. [12]

Code Service in Social and Health Care

The Code Service maintained by THL manages the preparation, distribution and maintenance of nationally uniform social and health care code sets, classifications, terminologies, form structures and coded data specifications. Over 200 code sets have been published on the code server. Maintaining the code sets requires expert groups that consist of customers, interest groups and experts on the subject of a certain code set. Description and clarification of core functions, development of operations model, creation of quality and process indicators and change management of internal activities are the main goals of Code Service. [7]

The Act on the electronic processing of customer data in social and health care (159/2007) and the Decree on patient documentation (298/2009) state that THL is in charge of the Code Service. Ministry of Social Affairs and Health (STM) is responsible for the general planning, steering and monitoring of the electronic processing of social and health care customer information, related information management and the management and execution of nationwide information system services. STM has made a specific agreement with THL and the Social Insurance Institution of Finland (Kela) on the execution of nationwide data structures and electronic services as regards the National Archive of Health Information (KanTa). [7]

Structured data entry is performed multi-professionally, and under its principles essential details are compatible between the primary health care and specialist medical care patient information systems. Similarly, essential data structures are compatible between public and private service providers.
[13]

Study of Death Certificates

"Manual on certification of cause of death in Europe" provides a standard reference for the information to be collected in the death certificates by EU member states. Mortality data are the most important indicator to measure and compare health status at local, national and international levels, and are regularly and extensively collected. [1]

International variations in certifying and coding practices have not been widely examined. The SANCO project has outlined important recommendation to improve the situation.

- The international form of death certificate with four lines recommended in ICD-10 should be adopted.
- Development of international guidelines for certifiers would improve homogeneity.
- Querying and training of certifying physicians is an important method of improving data accuracy.
- Information on autopsies should be systematically recorded on death certificates.
- Implementation of automated coding systems to select the underlying cause of death. [14]

How to measure the quality of data on death certificates? A study conducted by Grippo, Grande and Pace introduces a set of indicators to derive information from every phase of CoD data production. It is a very helpful operational tool and a flexible way to analyze aspects affecting the quality of data at different levels of detail. What to measure:

1. Number of conditions reported.
2. The positioning of conditions.
3. The interval between the onset of the disease and death.
4. The application of UC selection rules.
5. The specificity of the UC. [15]

To our knowledge such a research has not been conducted in Finland.

For acceptable quality of CoD statistics, proper functioning of every step in this CoD collecting process is essential. The validity of statistics is based on the quality of certification. Statistics Finland matches the information of deaths from the Population Information System with individual death certificates and this way follows the completeness of CoD statistics. Complete coverage of deaths by medical death certificates is not as such a sufficient guarantee of valid CoD statistics. Individual certificates must fulfill certain qualifications: Certified causes of death should be based on appropriate investigations, the interpretation of findings - as to the causation of death - must be sound, and the certification itself be clear, consistent, and according to regulations and rules. [16]

In Raimo Lahti's academic dissertation, three stages of CoD-collecting process were assessed: 1) use of autopsy in CoD determination and certification as an indicator for the reliability of national mortality statistics on the disease category concerned, 2) the correctness of medical death certificates, and the effect on national CoD statistics of validation by query to certifier or consulting medical expert, or both of unsatisfactory certificates, and 3) classification and coding of the medico-legally proven alcohol or drug poisonings, or both according to the ICD-10. In his study, Raimo Lahti states that systematic medical validation of insufficient and inconsistent death certificates at a statistics office by expert consultation and query to the certifier for further information promote the correctness and specificity, especially, of medical information on death certificates in Finland. [16]

A Survey of Completing Death Certificates

For the use of this report an assessment among the current users of patient record systems in Finland was made. User-centered design (UCD) is an approach that involves end-users throughout the development process so that technology support tasks are easy to operate, and are of value for the users. In this survey, a

user-centered approach and benchmarking were fairly lightly adapted to involve end-user opinions in a design phase. An email survey was sent to attending physicians all around Finland using any patient information system to gain a general view of how death certificates are issued in cases of others but medico-legal autopsies.

Purposive sampling was used to recruit recipients. Both attending physicians as well as assistive staff issuing death certificates were involved. Also system suppliers of the most common patient record systems (i.e. Effica, Uranus and Mediatri) in Finland were employed. A total of eleven (11) email questionnaires were sent out during October 2014 – December 2014. Moreover, four (4) medico-legal offices of the Forensic Medicine Unit of THL were asked for their personal opinion.

Altogether four email responses, three of them from attending physicians and one from a patient information system supplier, were received. Four (4) medico-legal officers volunteered by contributing their experience. Also, Statistics Finland has been very cooperative in development work from statistical perspective. Five participants of user survey are enough to gather most usability problems there are. In usability engineering, an ongoing debate exists about user testing sample size. Using five participants in testing reveals 85% of the often occurring usability issues in the product [17].

Email questions sent out for the survey are listed in Appendix 1.

Results can be broken down into disadvantages as follows.

Comments of death certificate forms in patient information systems:

- Online guide for filling-in instructions needed.
- Autofill functions needed. Only a few fields are automatically filled in i.e. name, social security number and issuer data.
- Forms' tab order is illogical.
- No autocorrect functions available.
- A Swedish language form is not as easy to fill in as the Finnish one.

Reasons of why death certificates are received back for rewriting:

- The underlying cause of death is wrong or missing.

Other comments:

- It takes a long time to fill in Details section.
- Printing and retyping is now easier than before by handwriting.
- Determination of diagnosis might be difficult.
- All physicians don't themselves write (they dictate) death certificates. No impact on their work.
- Lack of medical sample results often yields delays in issuing death certificates.
- A large amount of data to be collected for statistical reasons. The purpose of all data is unclear to some physicians issuing death certificates.

Comparison of International Rules with National Ones – a Quality Check

Below is shown the Medical Certificate of Cause of Death is recommended by the World Health Organization for international use (Figure 3) and the corresponding Finnish version of it (Figure 4).

Cause of death			Approximate interval between onset and death
Part I			
Disease or condition directly leading to death*	a)		
		Due to (as consequence of)	
Antecedent causes	b)		
Morbid conditions, if any, giving rise to the above cause, stating the underlying condition last		Due to (as consequence of)	
	c)		
		Due to (as consequence of)	
	d)		
Part II			
Other significant conditions contributing to death, but not related to the disease or condition causing it			
**This does not mean the mode of dying, e.g. heart failure, respiratory failure. It means the disease, injury or complication that caused death.*			

Figure 3. International form of medical certificate of cause of death [1]

	8. Causes of death	Aetiology code[1] or	Manifestation code[2] and/or	ATC code	Assumed duration between onset and death
	8.1. Diseases, injuries, poisonings and external causes of death	External cause[3]	Main injury[4]		
A	a. Immediate cause of death (does not mean the mechanism of death or terminal event)	1 / 3	2 / 4		
B	b. Intermediate cause(s) of death	1 / 3	2 / 4		
C	c. Underlying cause of death (must be filled in)	1 / 3	2 / 4		
	8.2. Other notable diseases, injuries and conditions contributing to death				
		1 / 3	2 / 4		
		1 / 3	2 / 4		
		1 / 3	2 / 4		

Figure 4. Finnish form of cause of death

Comparing the Finnish form with the reference form, we note the overall similarity of them. The Manual on certification of causes of death in Europe gives instructions of how to fill the causal sequence in part I. It states two things:

1. The lowest line used indicates the underlying cause.
2. There always must be an entry on line (a). [1]

In Finland there is an exception to these rules. The underlying cause must always be entered on line (c) including the possible causal sequence on lines (b) and (a). The immediate cause of death on line (a) may also be empty or marked as (a) = (c). In case (a) = (c), (b) must be left empty.

The reason for deviating from international guidelines is to ensure reliable determination for the cause-of-death. On the other hand, this procedure has caused some misunderstanding of how to proceed in cases of only one or two causes of death. As a solution a clear guidance must be provided.

The additional information box is not part of the medical part of the international certificate of death recommended by WHO. However, its intended use is to provide a frame to collect important information as recommended by WHO and EUROSTAT (Figure 5**Virhe. Viitteen lähdettä ei löytynyt.**).

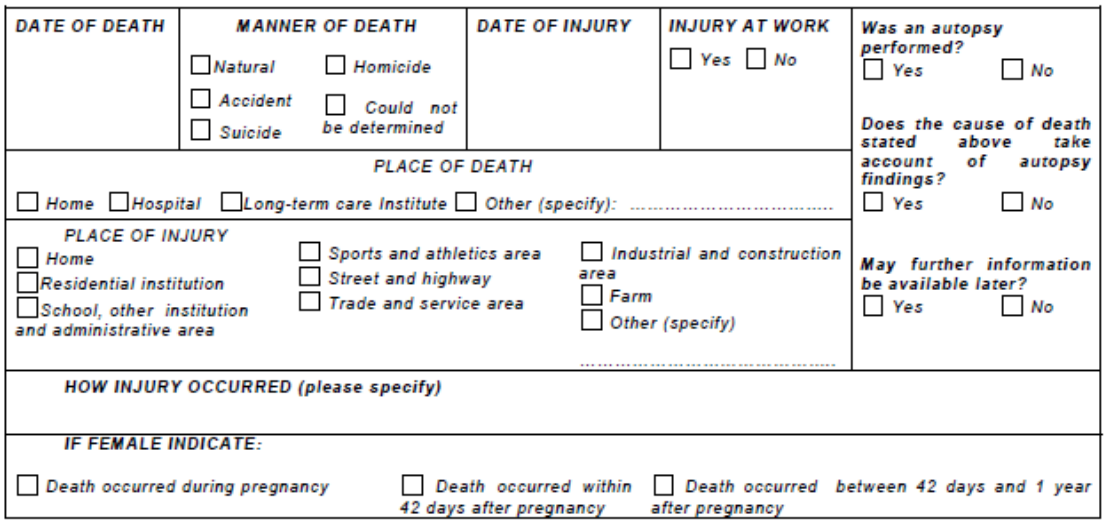


Figure 5. The additional information box recommended by WHO and EUROSTAT [1]

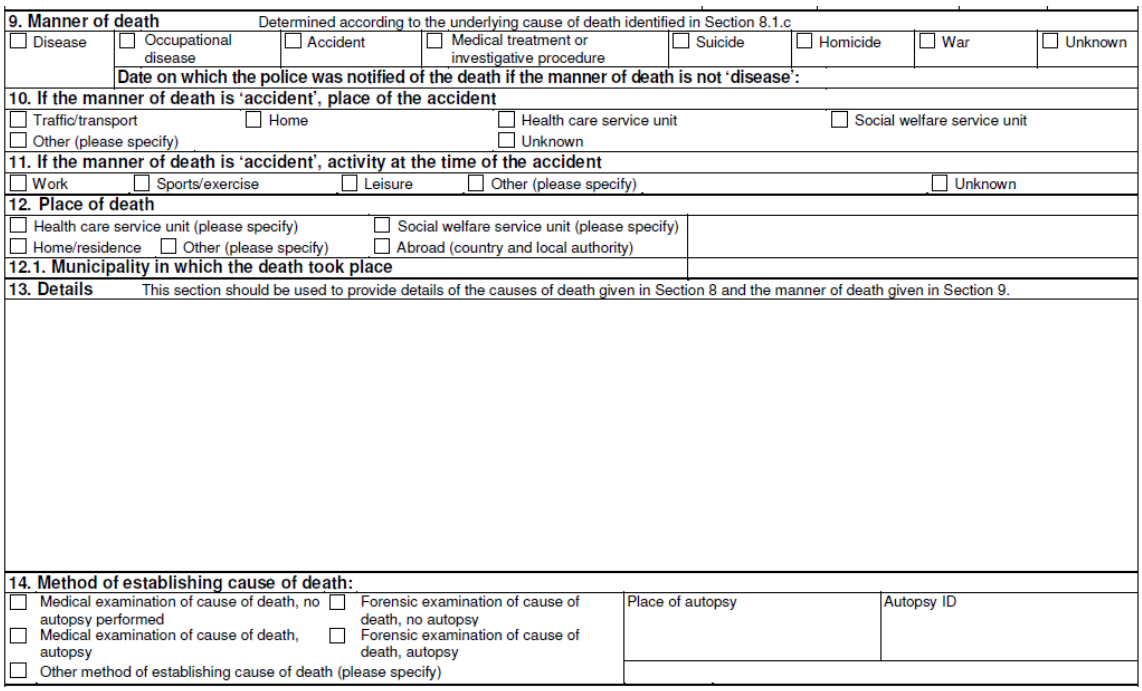


Figure 6. The additional information on Finnish certificate form

Comparing the Finnish form (Figure 6) with the reference form (Figure 5), it is fair to say that the Finnish form is in line with recommendations given by WHO and EUROSTAT.

Results of Comparison

According to Manual on certification of cause of death in Europe a properly completed cause-of-death section

- Is clearly legible;
- Does not contain abbreviations of medical terms;
- Always shows an entry in line (a) of part I;
- Enumerates the conditions in ascending order of casual sequence in part I;
- Shows always the main sequence that led to death in part I;
- In no occasion shows the underlying cause in part II (8.2.);
- Has always an entry for duration where appropriate. [1]

A Finnish death certificate is scored by the above rules. The results can be seen in a table below (Table 1).

Definition:	**Note:**	**Check**
Clearly legible	If electronic	✓
Abbreviations of medical terms not used		✓
Always shows an entry in line (a) of part I	always an entry in line (c)	✓
Ascending order of causal sequence in part I		✓
Shows always the main sequence		✓
In no occasion shows the underlying cause in part II		✓
Has always entries for duration where appropriate		✓

Table 1. Finnish death certificate – a quality check

Results of Survey

Survey of the Finnish certificate made for this report outlines the overall high quality of certificates with the following notes. They are:

1. No regional differences but differences relating to individual habits of physicians issuing death certificates.
2. Underlying cause of death not always acceptable by Statistics Finland.
3. Use of medical terminology, the meaning of which may not be clear to others reading death certificates, should be avoided.
4. Details section is too long or includes epicrisis i.e. all medical case history of a patient.
5. Ascending order of casual sequence is wrong.
6. Manner of death marked wrong.

The overall opinion seems to be that patient record systems are of no help when completing death certificates. The work does not get done any faster than before as systems do not provide any help functions or instructions.

The ongoing e-certificate project aims to improve the situation. As a solution we have come up with the following improvements to be made or considered for the above mentioned notes. They are:

1. More education is needed. A common quality manual with process maps and procedures to be produced. It should include the best practices of the profession.
2. There are common systems available to automate the entry and classification of cause-of-death information. However, more thorough research is necessary on this idea.
3. Education and the best practices suggested when appropriate.
4. As above.
5. Education and examples to be provided not to list medical conditions which have no causal relationship to each other.
6. As above.

Deviations and Proposals for Development as a Framework

What is an electronic death certificate? It

- Is an electronic form.
- Enables online collaboration among multiple death data providers and death registration users.
- Provides user-friendly data entries.
- Has internet accessibility and
- electronic authentication.
- Benefits in greater efficiency,
- higher quality and
- increased security.

To achieve all this, an electronic death certificate has:

- Built-in real time edits.
- Online help and instructions

The project must also provide:

- Training and education.
- User manuals.
- Best practices.

In our previous report for Objective 1 we introduced a SWOT analysis (Figure 7) to build up a strategy for e-certification development work within THL. New death certificate forms are now in use covering the whole country of Finland. In few cases old forms are still used. If so, they are sent back to be reissued. Process flows are defined and introduced in a delivery report for Objective 1 accordingly. Renewed paper forms have been used as an input for e-certificate development work done in the Forensic medicine information system project. CDA R2 compatible national data structure was initially approved and published in December 2013. Due to problems in specification of structured data model, it had to be redefined. A complete and approved CDA R2 structure is introduced later in this document.

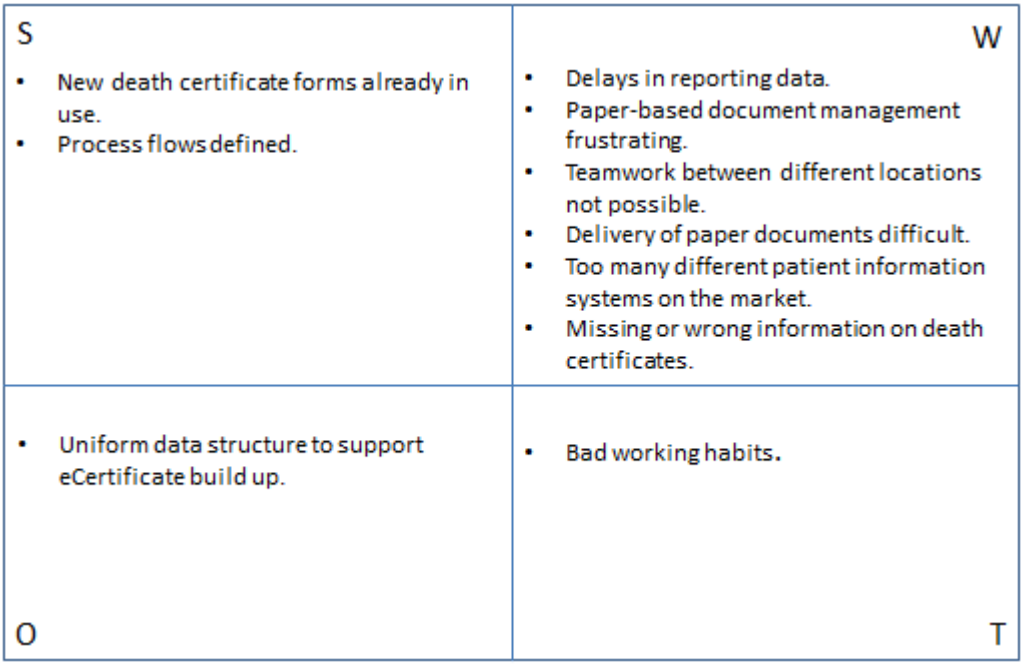


Figure 7. SWOT analysis for Objective 1

There are significant delays in reporting death data. According to the present Act 459/1973, death certificates must be issued as soon as possible after the death and no later than three months after it. This three month limit is today too often overrun. Death certificates, either hand-written forms or printouts from patient information systems, are today still verified and archived in paper. We expect the new electronic system to enable documents and records management throughout the document life-cycle, from creation to archiving, faster and with quality.

Bad working habits will be overcome with education and knowledge sharing. Production of quality manual is suggested. Teamwork will be easier in the future as a new electronic system will introduce a coherent process nationwide. By teamwork is meant location independent work of secretaries, for example.

A new SWOT analysis (Figure 8) has been made for Objective 2 respectively. It represents the beginning phase of e-certification project.

S	W
• Paper forms of death certificate renewed. • Processes defined. • A comprehensive process of death certificate verification in place. • CDA R2 compatible national data structure ready.	• Delays in reporting data. • Paper archiving. • Missing or wrong information on death certificates. • National legislation to be clarified. • Amount of patient information systems huge. • No access to KanTa. • Patient record system suppliers are privately owned. • Standards and compatibility disorganized.
• The increased manpower of e-certificate project. • Piloting of the Forensic medicine information system in the near future. • Role of THL being a common authority to give regulations.	• Challenges of electronic digital signature. • Delay of the Forensic medicine information system delivery. • Integrations between stakeholders challenging. • Bad working habits.
O	T

Figure 8. SWOT analysis for Objective 2

In the beginning of the e-certificate project paper forms of Finnish death certificates were renewed. In accordance with the present Act 459/1973 and the present Decree 948/1973, all cause-of-death investigations, including statistical reporting and archiving of death certificates, must be properly collected and reported. Commission Regulation 328/2011 aims to improve data comparability between member states. Also, the adoption of a common framework in the area of public health and health and safety at work (EC No 1338/2008) is aimed at guaranteeing the systematic production and the quality of data. All these regulations have been as an input for the renewal work. Renewed paper forms of death certificates have been a basis for a CDA compatible national data structure presented in the next chapter.

All internal and external processes are defined and data flows of the main stakeholders documented as reported in delivery for Objective 1. Processes will be integrated in the new Forensic medicine information system to tackle problems in archiving and delivery within THL. The process flow of archiving and delivery is presented in our delivery report for Objective 1 respectively.

The CDA data structure has required a lot of studying. Form structures of two different death certificates (Death Certificate for a person aged 28 days or over and Death certificate for stillbirths and deaths in the first 28 days of life) with extra pages have not been straightforward to implement. The data structure includes code sets that have not been ready in time. One example of such a set is a list of Local Register Offices in Finland. Also, it is desired that electronic forms retain the appearance and structure of paper versions when printed out.

Today, medico-legal documents cannot be stored for a long-term retention in an electronic form. They must be printed on paper for archiving. The requirement of data control in the long-term storage concerning the information deliverance is defined by the SÄHKE2 order of The National Archives Service of Finland, and by the SÄHKE2 based recommendation (The Public Administration Recommendations JHS176) on electronic document management and archiving. There is an option of archiving the death certificates in the Finnish National Archive of Health Information (KanTa). Presumably, communication through a message queue of the KanTa can be used in the year 2017 at the earliest. Currently, there are both technical and legislative obstacles preventing us from using the message queue.

The increased manpower has resulted in schedule catch up of Eurostat (EDC) project. Piloting of the Forensic medicine system will start as soon as it has been successfully delivered. We believe it to happen

during the first quarter of 2015. Electronic death certificates will be an essential part of piloting. Piloting should include not only delivery but also exploitation of death certificate data in statistics production. The results will be introduced in deliverable for Objective 3.

An electronic digital signature is still a question. The qualified certificate has to meet the requirements set forth in the Finnish Act on Electronic Signatures 14/2003 (Section 7(2)). The qualified certificate is issued by a certificate authority meeting the requirements in Sections 10 to 15 of the aforementioned Act. The Population Register Centre became on April 1, 2003 the first, and so far the only, certificate authority of qualified certificates in Finland. There are two certificates, one of them being a verifying and encryption certificate and the other a so-called signature certificate, or a qualified certificate. The signature certificate by the Population Register Centre is a qualified certificate. [18] A digital signature is needed for death certificates issued and / or verified by THL medico legal officers.

HL7 CDA R2 Document Template of the Finnish Death Certificate

In HL7 V3 definition every data element has a data type. Data types define the meaning or semantics of data values that can be assigned to a data element. Data types are thus the basic building blocks used to construct any higher order meaning: messages, computerized patient record documents, or business objects and their transactions. Data types can be of a basic type or, of a generic or parameterized type. For example, Boolean, binary, text and multimedia are of a basic type. List and sets are typical generic types of data. [19]

From a technical perspective, the CodeServer (http:/koodistopalvelu.kanta.fi/codeserver/) has two kinds of classifications: organizations and codes. The classification of codes consists of single codes, such as the ICD-10 classification of diseases, and their metadata. The classification of organizations consists of single organization units and their data, including hierarchical levels. [7]

Data structures produced by the Code Service, such as code sets, classifications, terminologies, form structures, and other coded content specifications, are published on the code server. Code sets accepted to be published on the code server are edited in an MS Excel spreadsheet where the data required by the code server are filled in the appropriate fields. In addition to the contents, for example, an identifier, name, purpose and responsible organization are specified for each imported code set. [7]

Below are seen snapshots with explanations of a spreadsheet representing the Finnish death certificate (Tables 2 – 13) for a person aged 28 days or over i.e. HL7 CDA R2 template of it. A full version is attached in Appendix 2 (the latest approved version published on the code server).

	A	B	C	D	E	F	G
1	CodeId	A:Kuolinto	A:Kuolintoc	A:Hautaus	A:Ilmoitukse	LongName	ParentId
2	0	T	T	T	T	Kuolintodistuslomakkeet 28 vrk:n ikäisestä ja vanhemmasta, THL	
3	500	T	F	F	F	Kuolintodistus 28 vrk:n ikäisestä tai vanhemmasta	0
4	501	F	T	F	F	Kuolintodistuksen lisäsivu 28 vrk:n ikäisestä tai vanhemmasta	0
5	502	F	F	T	F	Lupa hautaamiseen 28 vrk:n ikäisestä tai vanhemmasta	0
6	503	F	F	F	T	Ilmoitus kuolemasta väestötietojärjestelmään 28 vrk:n ikäisestä tai vanhemmasta	0

Table 2. HL7 CDA R2 Structure of the Finnish Death Certificate

A	CodeId	CodeId number
B	Kuolintodistuksessa	Existing on the first page of death certificate T / F
C	Kuolintodistuksen lisäsivulla	Existing on the extra page of death certificate T / F
D	Hautausluvassa	Existing on the burial permit T / F
E	Ilmoituksessa kuolemasta VRK-järjestelmään	Existing on the notification of death to the Population Information system T / F
F	LongName	Form title
G	ParentId	Empty if HierarchyLevel = 0, CodeId of the parent form

Table 3. HL7 CDA R2 Structure of the Finnish Death Certificate – Explanations of column terms

H	I	J	K
HierarchyLevel	**Abbreviation**	**ShortName**	**Description**
0	Kuolintodistuslomakkeet 28 vrk:n ikäisestä ja vanh	Kuolintodistuslomakkeet 28 vrk:n ikäisestä ja vanh	Kuolintodistuslomakkeet 28 vrk:n ikäisestä ja vanl
1	Kuolintodistus 28 vrk:n ikäisestä tai vanhemmasta	Kuolintodistus 28 vrk:n ikäisestä tai vanhemmasta	Kuolintodistus 28 vrk:n ikäisestä tai vanhemmasta
1	Kuolintodistuksen lisäsivu 28 vrk:n ikäisestä tai	Kuolintodistuksen lisäsivu 28 vrk:n ikäisestä tai	Kuolintodistuksen lisäsivu 28 vrk:n ikäisestä tai va
1	Lupa hautaamiseen 28 vrk:n ikäisestä tai vanhemmas	Lupa hautaamiseen 28 vrk:n ikäisestä tai vanhemmas	Lupa hautaamiseen 28 vrk:n ikäisestä tai vanhem
1	Ilmoitus kuolemasta väestötietojärjestelmään 28 vr	Ilmoitus kuolemasta väestötietojärjestelmään 28 vr	Ilmoitus kuolemasta väestötietojärjestelmään 28 v

Table 4. HL7 CDA R2 Structure of the Finnish Death Certificate (continued)

H	HierarchyLevel	Hierarchy level
I	Abbreviation	Abbreviation
J	ShortName	Short name
K	Description	Description

Table 5. HL7 CDA R2 Structure of the Finnish Death Certificate – Explanations of column terms (continued)

L	M	N	O	P
ALONG:Kentän täyttöohje	**BeginningDate**	**ExpiringDate**	**A:Järjestys**	**A:Tietokentän oid tunniste**
Lomakkeisto: sisältää sivut kuolintodistus, kuolintodistuksen lisäsivu, lupa ha	20141201	20991231	1	1.2.246.537.6.12.2002.154.0
Kuolintodistuslomake 28 vrk:n ikäisestä tai vanhemmasta	20141201	20991231	2	1.2.246.537.6.12.2002.154.500
Jos jokin tieto ei mahdu sille varattuun kenttään kuolintodistuksessa, voidaa	20141201	20991231	3	1.2.246.537.6.12.2002.154.501
Täytetään kaikki lomakkeen kohdat, minkä jälkeen lomake allekirjoitetaan ja	20141201	20991231	4	1.2.246.537.6.12.2002.154.502
Täytetään kaikki lomakkeen kohdat. Lomake allekirjoitetaan ja toimitetaan va	20141201	20991231	5	1.2.246.537.6.12.2002.154.503

Table 6. HL7 CDA R2 Structure of the Finnish Death Certificate (continued)

L	Kentän täyttöohje	Filling instructions
M	BeginningDate	Beginning date
N	ExpiringDate	Expiring date
O	Järjestys	Order
P	Tietokentän oid tunniste	OID - a globally unique local coding system identifier

Table 7. HL7 CDA R2 Structure of the Finnish Death Certificate – Explanations of column terms (continued)

Q	R	S	T	U	V	W	X
A:Tietotyyppi	**A:Tietotyypin t**	**A:Kentänl**	**A:KentänN**	**A:Kentän**	**A:Kentan p**	**A:Kentän t**	**ALONG:Ehdon_pakollisuus**
Label	LB				P	F	
Label	LB				P	F	
Label	LB				EP	T	Pakollinen jos Codeld 551 > 0
Label	LB				P	F	
Label	LB				P	F	

Table 8. HL7 CDA R2 Structure of the Finnish Death Certificate (continued)

Q	Tietotyyppi	Data type name
R	Tietotyypin tunniste	Data type symbol
S	KentänPituus	Length
T	KentänMinimiArvo	Min value
U	KentänMaksimiArvo	Max value
V	Kentan pakollisuus	Field obligatory
W	Kentän toistuma	Field repeatable
X	Ehdon_pakollisuus	Obligatory if

Table 9. HL7 CDA R2 Structure of the Finnish Death Certificate – Explanations of column terms (continued)

Y	Z	AA	AB	AC	AD	AE
ALONG:Koodistolista	**A:Koodiston OID**	**A:Koodistoviittaus**	**A:Taytetta**	**A:Kentä**	**A:CDATaso**	**A:Beskrivning**
			F		0 Lomake	Dödsattestsblankett för för 28 dygn gammal eller äldre avliden
			F		0 Lomake	Dödsattest för 28 dygn gammal eller äldre avliden
			F		0 Lomake	Tilläggssida till dödsattest för 28 dygn gammal eller äldre avlider
			F		0 Lomake	Begravningstillstånd för 28 dygn gammal eller äldre avliden
			F		0 Lomake	Anmälan om dödsfall till befolkningsdatasystemet för 28 dygn g

Table 10. HL7 CDA R2 Structure of the Finnish Death Certificate (continued)

Y	Koodistolista	Code list
Z	Koodiston OID	Code OID
AA	Koodistoviittaus	Code reference
AB	Taytettava kentta	Field mandatory T / F
AC	Kentän lisätieto	Field information
AD	CDATaso	CDA level
AE	Beskrivning	LongName in Swedish

Table 11. HL7 CDA R2 Structure of the Finnish Death Certificate – Explanations of column terms (continued)

AF	AG
LastModifiedDate	**LastModifiedBy**

Table 12. HL7 CDA R2 Structure of the Finnish Death Certificate (continued)

AF	LastModifiedDate	Last modified date
AG	LastModifiedBy	Last modified by

Table 13. HL7 CDA R2 Structure of the Finnish Death Certificate – Explanations of column terms (continued)

Discussion and Further Actions

The EDC action and the Forensic medicine information system project of THL run alongside. The Forensic medicine information system will assist the medical examiners in document creation of the medico-legal autopsies as well as in examining of all Finnish death certificates regardless of where they have been issued. The implementation phase began in August 2013 and we are expecting the programming work to be completed in early 2015. A Finnish software company is responsible for the technical implementation. However, the EDC action will continue.

A lot of technical design and development work is still needed for the ECD project. We expect to receive some technical assistance from the Social Insurance Institution of Finland (Kela) regarding message forwarding, the Information department of THL about Code Service and data structures, Population Register Centre about digital signatures, and the Finnish HL7 Association regarding KanTa interfaces.

We expect Statistics Finland to be able to receive electronic death certificates during the year 2015. For the purpose of Objective 3 we plan to pilot e-certificate first in the Forensic medicine information system internally, and late in cooperation with Statistics Finland. For that purpose we need to create piloting plans to define the scope and objectives of the pilot, identify pilot participants and where pilots will be conducted, with a schedule included.

On the market there are many interactive computer-based systems for coding multiple causes of death and for selecting the underlying cause of death. Effective with data year 1968, NCHS (National Center for Health Statistics) converted to computerized coding of the underlying cause and manual coding of all causes (multiple causes) on the death certificate. This system is called Automated Classification of Medical Entities (ACME). The multiple cause codes serve as inputs to the ACME software that employs WHO rules to select the underlying cause. [20] For statistical and research purposes, it is important that the causes of death and the underlying cause of death are reported as specifically and precisely as possible. The underlying cause of death is defined as

- a disease of injury which initiated the train of morbid events leading directly to death or
- circumstances of the accident or violence which produced the fatal injury.[1]

Inaccuracies in statistics can emerge from the initial entry by the attending doctor or medical examiners [21]. As there are means to automate the entry, classification, and retrieval of cause-of-death information reported on death certificates, we may raise a question if there could be a way to help anyone concerned already in earlier phase with the same technology, already when completing a death certificate without intruding clinical decision making of professionals.

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Appendices

Appendix 1: Email Questionnaire

1. Is your organization using any patient information system? If yes, what?
2. Have you recently received death certificates back to be rewritten?
3. If yes, why? For any particular reason?
4. Does the patient information system in use support your daily work
5. Do you find it difficult to fill in the death certificate form? If yes, in what way?
6. Has the patient information system (if applicable) helped you to perform faster than before?
7. Any additional feedback you wish to give.

Appendix 2: HL7 CDA R2 Document Template of the Finnish Death Certificate

1083_1390482573705.xls

http://koodistopalvelu.kanta.fi/codeserver/pages/publication-view-page.xhtml?distributionKey=4734

Pia Korpisaari

Objective 3: Piloting Electronic Death Certificates in the Forensic Medicine Information System

Deliverable for Objective 3
June 2016

Background

Electronic Death Certification (EDC) is a jointly funded action by the European Commission and the National Institute for Health and Welfare (THL) based on the EC Grant Agreement number 07154.2013.002-2013.626. The THL diary number for the action is THL/1802/6.00.00/2013. The action aims to improve the quality of Codes of Death (CoD) statistics and to strengthen the development of electronic tools, processing and data sharing for statistical purposes.

The European Commission has awarded a grant "E-certification of causes of death" for National Institute for Health and Welfare to achieve substantial results:

- A good overview of the current national situation on death certification
- Tools and practices for handling of electronic cause of death information
- A 20 % share of death certificates to be issued electronically after the action
- A detailed plan to help achievement of 100 % electronic death certificate rate.

The project has started in 2013 and will end in June 2016. The preparation and execution of the pilots documented in this report were organized in cooperation with the Statistics Finland (Tilastokeskus) that is the only Finnish public authority specifically established for statistics, and is the competent authority to produce statistics on causes of death and on mortality rate evolution.

Pilot 1: Creating HL7 Compatible Electronic Death Certificates in the Forensic Medicine Information System

Forensic Medicine Information System provides a secure method for electronic creation, update, certification and archive of death certificates. The CDA R2 compatible national data structure for electronic death certificates was approved in 2013 by the Ministry of Social Affairs and Health, finalized and newly published in 2014 being a part of Eurostat project Objective 2.

Death Certificate Template

Forensic Medicine Information System enables participants (i.e. medico-legal officers of THL, university forensic pathologist, specializing physicians) in the death registration process to file death records online creating the option of a paperless system. An electronic death certificate is compiled in the Forensic Medicine Information System database. Screenshots of an online form can be seen in Figures 1, 2 and 3. Personal data section of a form will be automatically filled out by the system. A certificate issuer fills in causes of death, manner of death and any other details before electronically signing the form.

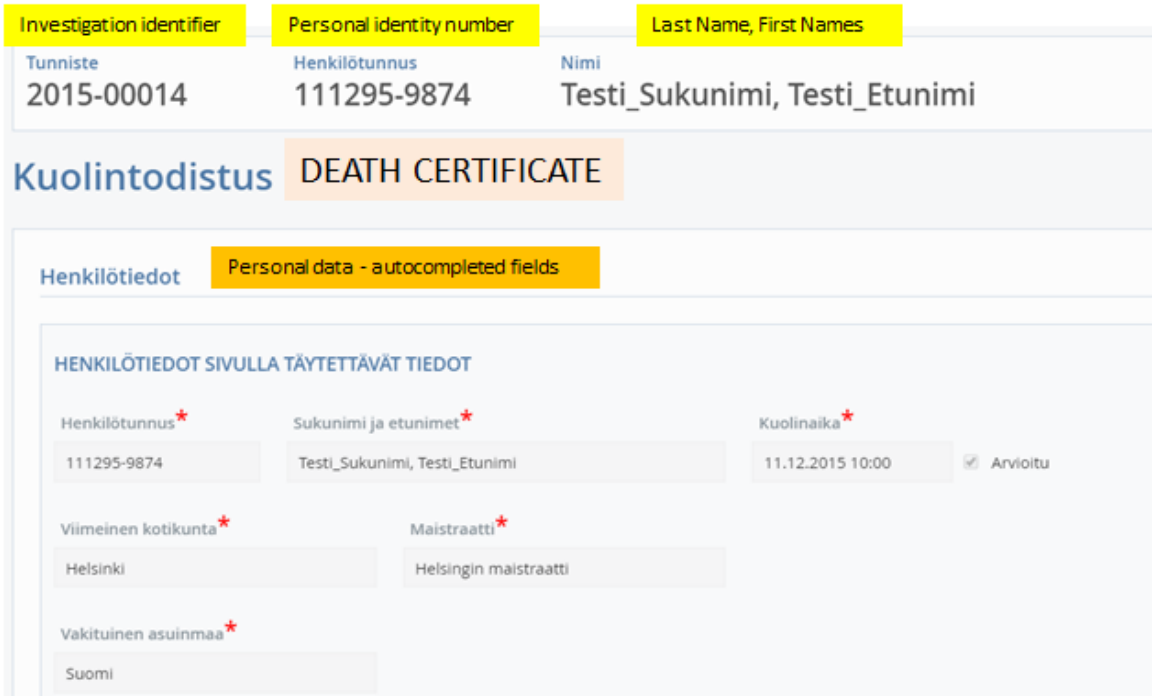

Figure 1. eCertificate Template - Personal Data

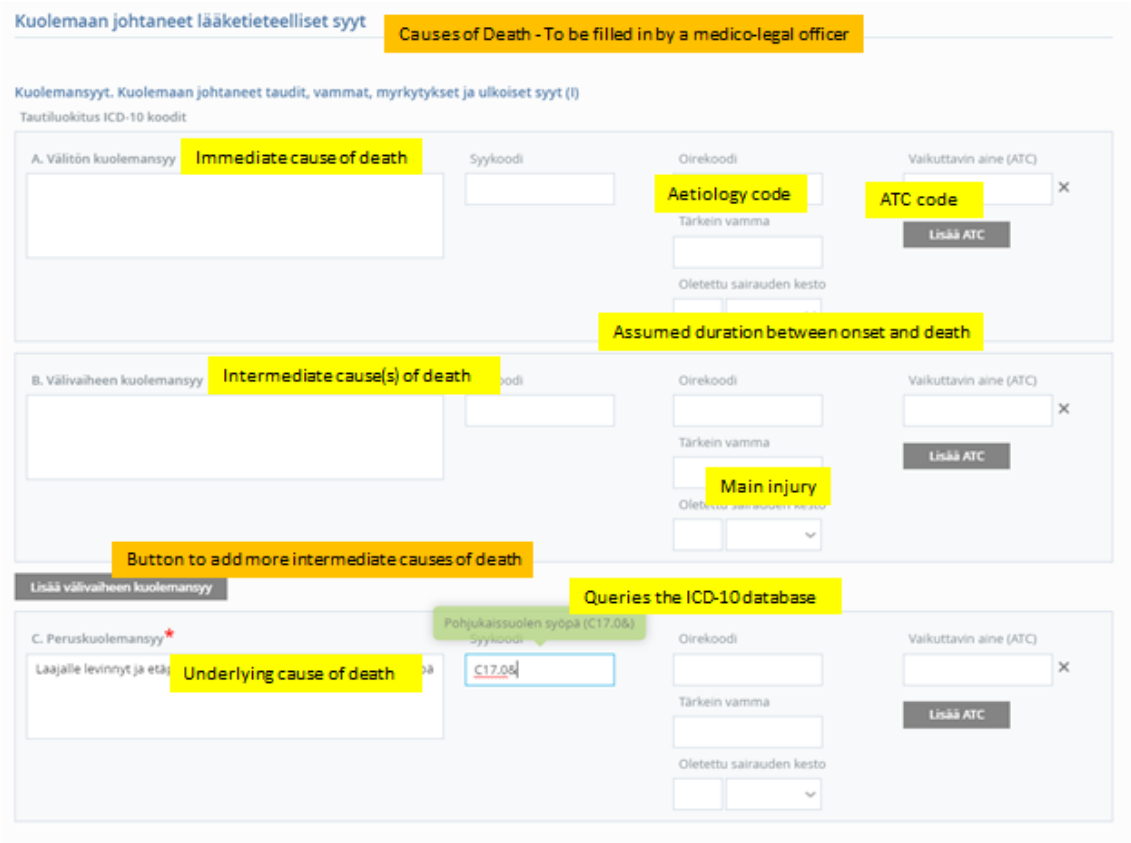

Figure 2. eCertificate Template - Causes of Death

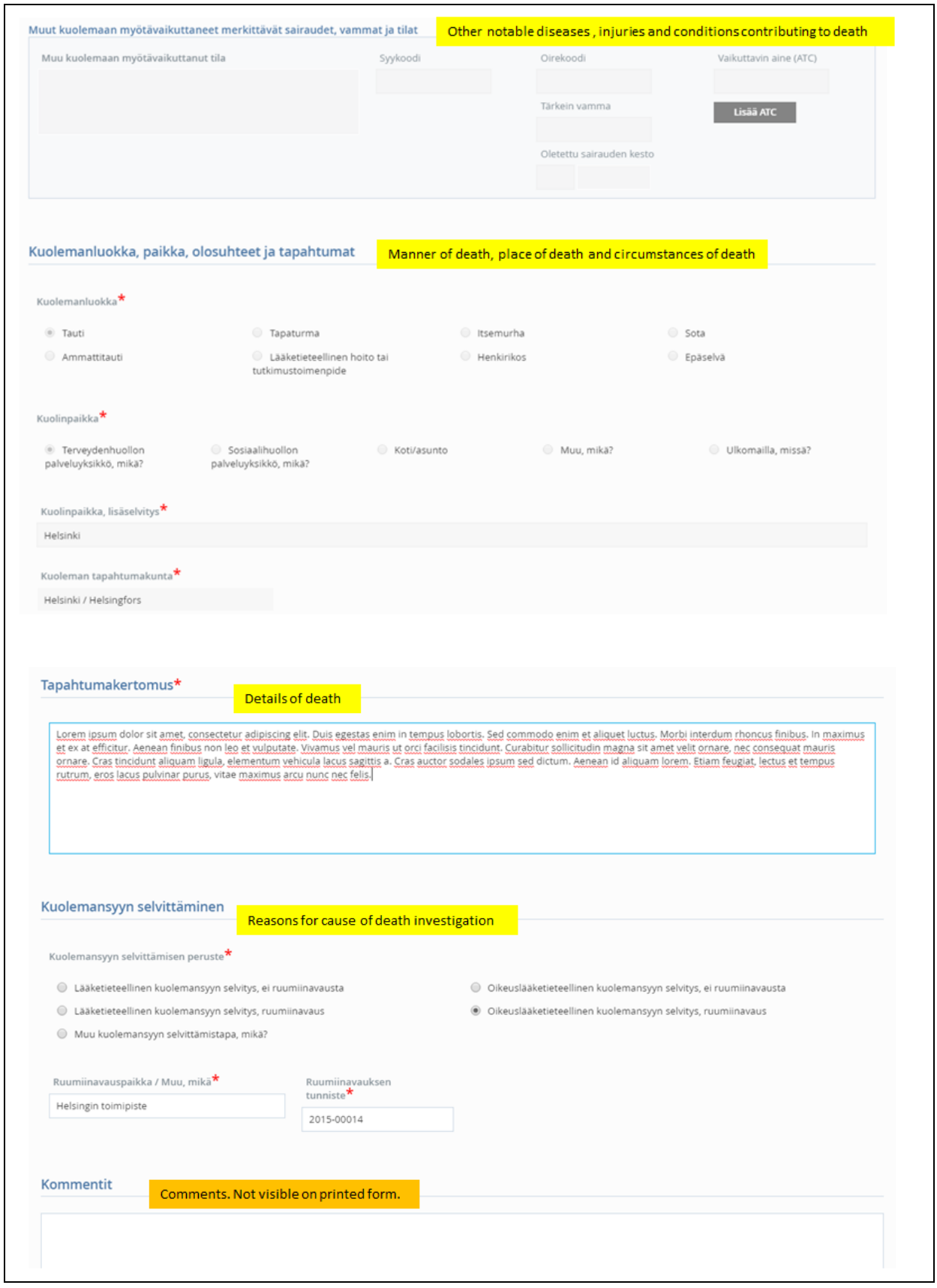

Figure 3. eCertificate Template - Other Details

Digital Signature

A digital signature (seen in Appendix 1), which makes use of a technology known as public-key cryptography, is used for marking or signing an electronic document. A process is analogous to paper signatures. Directive 1999/93/EC of the European Parliament and of the Council of 13 December 1999 on a Community framework for electronic signatures lays down the criteria that form the basis for legal recognition of eSignatures. It focuses on regulating certification-service providers. [1]

Several private digital signature service providers operate in Finland. Documents signed through these services guarantee that a document can be processed by authorities and comply with the legal requirements for written documents and signatures. [2]

The Population Register Centre (VRK) provides certificates for citizens, organizations and the health care sector. Certificates are needed for identification, encryption and electronic signatures in information networks. Conventional personal identification methods are not possible on online services. Certificate products produced by the Population Register Centre include a citizen certificate on the ID card issued by the police, special smart cards, and server and e-mail certificates. The Population Register Centre also issues biometric signature certificates for travel documents, such as passports.

The Population Register Centre's certification authority (CA) services are based on special legislation. The Act on the Population Information System and Certificate Services Provided by the Population Register Centre (661/2009) and the Act on Strong Electronic Identification and Electronic Signatures (617/2009) form the legislative basis for the certificate policy. [3]

In Forensic Medicine Information system three types of smart cards provided by VRK are accepted. A properly filled out and an ID card signed (Figure 4) death certificate can be converted into PDF document format to be printed out (see Appendix 1). However, printouts are no longer needed. Electronic death certificates are first digitally signed, then verified / approved online i.e. digitally signed again, and electronically delivered to Statistics Finland.

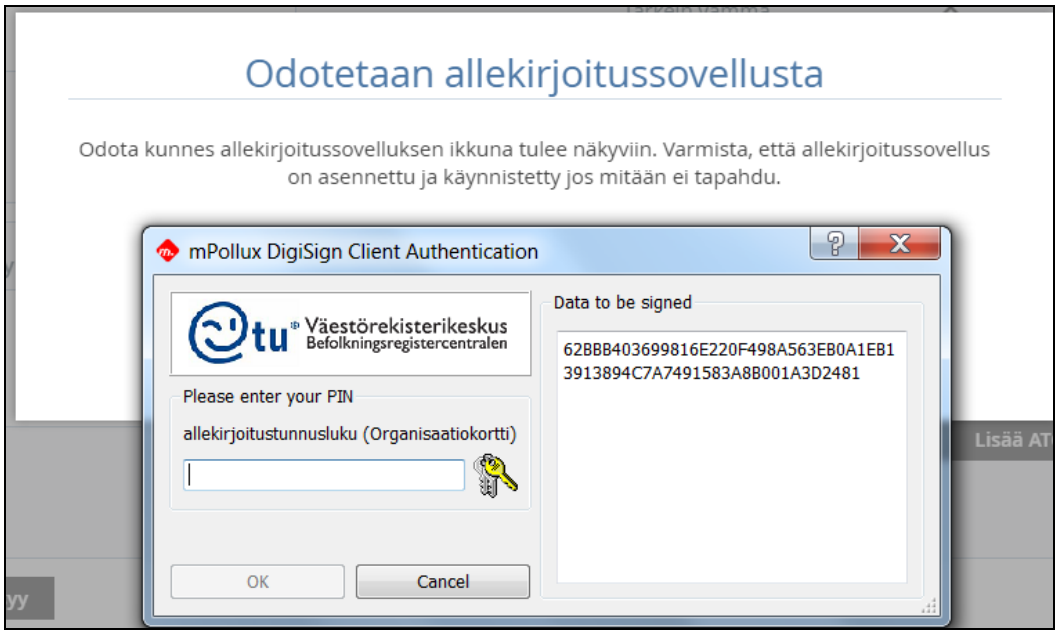

Figure 4. eDeath Certificate - Digital Signature

Medico-legal officers in THL are responsible for certification / approval i.e. verification of death certificates. All electronic death certificates due to forensic autopsies are verified i.e. approved by a medico-legal officer other than the issuer in the Forensic Medicine Information System. A process flow of death certificate verification is presented in Figure 5.

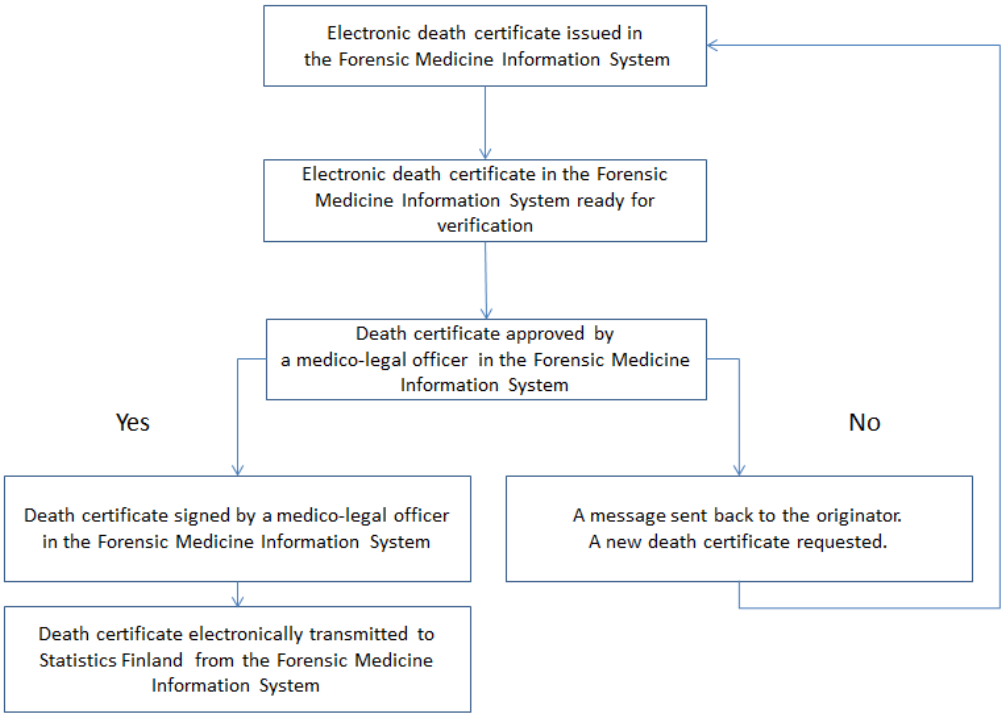

Figure 5. A process flow of death certificate verification in the Forensic Medicine Information System

Fully HL7 compatible electronic death certificates have been successfully created in the Forensic Medicine Information System since 1st January, 2016. During the first three months after a successful implementation, from January to March, the electronic death certificates issued in the National Institute for Health and Welfare are:

- all of them have been electronically created in the Forensic Medicine Information system
- almost all of them have been electronically signed
- a few of them have been electronically verified / approved
- none of them have been electronically transferred to Statistics Finland.

With effect from 15th April, 2016 electronic death certificates have been electronically signed, electronically verified, and electronically transferred to Statistics Finland.

Benefits and Burdens

There is no exact statistical information available of the processes yet. However, the users of Forensic Medicine Information System have complained the verification process taking three times more time than done by a pen and paper. There are many reasons for this. Users are yet not familiar with the new information system. Users are not mature users of IT and computer tools. The verification system is yet not properly documented or introduced. The system does not allow signing more than one document at a time which makes the signing process a bit slow. A new SWOT analysis was made at this point. It is presented in Figure 6.

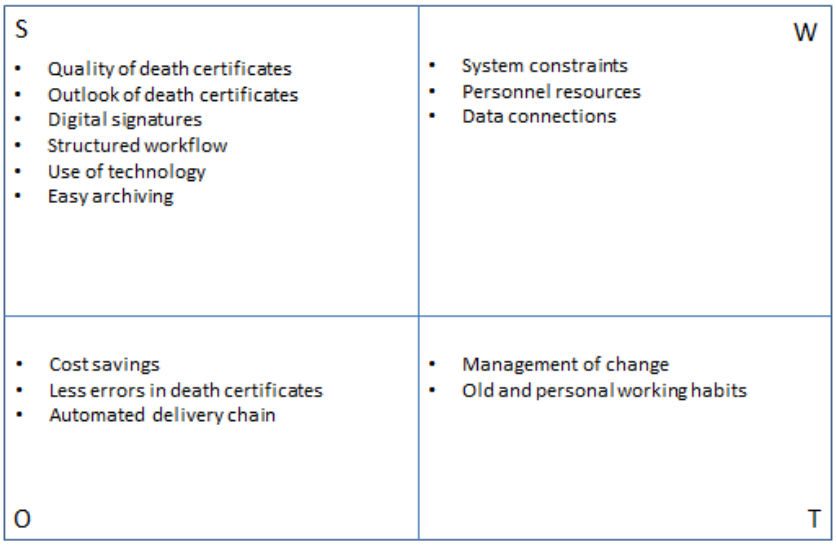

Figure 6. SWOT Analysis after Piloting Electronic Death Certificates in the Forensic Medicine Information System

It is obvious organizational and cultural separation between users and designers might result in a large gap between software designers and those who actually use it. Problems can only be solved in interrelation to one another. A new system will not resolve any problems that lie within the processes. The organization must be aware that processes that have worked in the past may no longer be adequate. We have tried to analyze and address these problems in a workshop that was held on May, 2016. The results of the workshop are documented later in this report (Post Piloting Process Improvement Steps).

Future Work

Electronic death certificates are to be received into a computerized database of Forensic Medicine Information System from medical certifiers all over Finland. However, medical certifiers are not obliged to provide electronic death records. Medical certifiers may certify deaths either by electronic or a paper certificate. Special and practical arrangements, including national legislative regulatory framework for electronic communications, for certifiers outside National Institute for Health and Welfare will be carried out beyond the Eurostat project. It will be reviewed further in Objective 4, when presenting a national plan for how to move to entirely electronic death certification using the experience from the pilots of Objective 3.

Pilot 2: Transferring Electronic Death Certificates to Statistics Finland

Interoperability describes the extent to which systems and devices can exchange and share data. Health information systems architecture must be interoperable in order to interpret the shared data. The Service Orientated Architecture (SOA) and a standardized structured information model based on the extensible markup language (XML) together help in storing and sharing medical information in a uniform way. The Clinical Document Architecture (CDA), a markup standard developed by the HL7 organization, defines the structure of clinical documents. The CDA is based on XML. [4][5]

The Finnish model using the SOA architecture and a highly structured implementation of CDA R2 provide a solid infrastructure for gathering nationwide health information in the centralized archive. The Finnish national archive of health information is called The National Archive of Health Information (KanTa) and includes the following services:

- electronic prescriptions or ePrescriptions
- the electronic patient records archive or eArchive.

Under the Act on the Electronic Processing of Client Data in Social and Health Care Services (159/2007), public healthcare organizations are obliged to enter patient records in a nationally centralized archive. Deployment of the centralized archive is mandatory for private healthcare organizations having an electronic system for long-term storage of patient records. [6][7]

In the KanTa system all national healthcare information is stored and managed in a centralized system. To access the centralized system, KanTa provides a unified messaging interface based on HL7 v3 messaging to transport HL7 CDA R2 documents. The security of the received messages is controlled by the authentication and access control layer. Authentication and digitally signed XML documents are based on the public key infrastructure (PKI) using smartcards, and communication between servers is protected by secure sockets layer (SSL) connections. [5]

KanTa Messaging Interface

There are different ways to connect KanTa services: direct connection, connection using patient information systems of the market, external services (e.g. SaaS) or Internet. Prior to connecting, an organization must be registered as a user, and the interfacing system must be documented and audited. [6]

The Forensic Medicine Information System of THL has not been audited with respect to KanTa messaging interface. Audit requirements concern functionality, interoperability and data security. All organizations joining the KanTa services, as well as parties providing intermediary services, draw up an in-house control procedure [8]. There is no reason for weighty auditing process unless KanTa interface is ready and steady, and data ownership of CoD registry (see Chapter 3, “Statistics Finland, KanTa Repository and THL Registers”) is fully defined.

Records, including death certificates, due to forensic autopsies in Finland are police records and classified “secret”. At the moment there is no option to store the records in KanTa repository as they are not classified as medical / patient records.

Connection to KanTa interface will not happen at this state due to before listed obstacles. In addition, there is, for the time being, a direct connection between the forensic medicine information system and Statistics Finland. In delivery for Objective 4, we have overcome the problem by ignoring the first proposed KanTa interface. We have made a proposal to use KAPA interface instead.

Direct Connection to Statistics Finland

Statistics Finland maintains the Finnish archive of death certificates. A direct connection has been established between Forensic Medicine Information System and Statistics Finland. During Objective 3, pilot messages using XML schemas have been successfully sent from THL to Statistics Finland.

A receiving party has validated all messages received. The National Institute for Health and Welfare (THL) and Statistics Finland have made an agreement to end paper delivery of death certificates as from 20 June 2016.

Statistics Finland receives death certificates from THL through an always online web service. The death certificate is sent in XML-markup with the secure HTTPS network protocol. For security purposes, the message needs to contain a recognized client certificate and the network firewall only allows messages from a given IP-address belonging to THL.

The message contains a Base64 encoded death certificate in CDA standard XML-markup, a digital signature key and a PDF/A version of the death certificate form. The received message is sent to a separate service that decodes the XML, checks the CDA schema, validates and cleans up the data and writes it to database. For example, the service checks that the given national identification number is correct or generates one if it is not. Additionally the service saves the original XML and PDF files to disk for archiving and information service purposes.

After this, the statistical process works the same as before (See Chapter: Pilot 3). Instead of optically reading paper death certificates, the electrical death certificates are handled automatically as fast as they are sent from THL. Possible exceptions are handled manually.

Pilot 3: Archiving and Utilizing Electronic Death Certificates in Statistics Finland

Statistics Finland is the competent authority to produce statistics on causes of death and on mortality rate evolution. Statistics Finland also holds the mandate of the archival authority and maintains the Finnish archive of death certificates. The archive contains death certificates of Finnish residents since 1936. Copies of death certificates and unit level data on causes of death are released from the archives for the purposes specified in the Act on the Inquest into the Cause of Death (459/1973). These purposes cover the releasing of data to 1) the deceased person's next of kin, 2) a pension institution or to the authorities, 3) for scientific research or statistical surveys. [9]

Statistics Finland, KanTa Repository and THL Registers

Statistics Finland is the general authority within the National Statistical Service whose main task is to direct and develop national statistics. The Statistics Act defines four statistical authorities (the Information Centre of the Ministry of Agriculture and Forestry, National Institute for Health and Welfare (THL), Statistics Finland and the Finnish Customs) having right to collect data for statistical purposes prescribed in law. [9] [10]

The Patient Data Repository is a national repository service where health care service providers store information on treatments of living patients. Death certificates issued afield outside THL are archived in the repository. Documents due to medico-legal autopsies are not medical records to be included in patient data or to be archived in the repository. Thus, Patient Data Repository provided by KanTa services cannot be utilized for archiving all Finnish death certificates without changing the law. It, however, is not to foresee in near future.

As an outcome of the situation there are two archives of death certificates: death certificates issued afield in patient information systems and archived both in the KanTa Repository and Statistics Finland, and death certificates issued in the Forensic Department of THL and archived in Statistics Finland. The share of 80 % of all death certificates archived in the KanTa Repository is not approved by medico-legal officers of THL i.e. is missing the second digital signature seen in Appendix 1.

Separate provisions apply to data collected for statistical tasks and for the national health care personal data files maintained by THL, and to the assignment and confidentiality of such data. The National Institute for Health and Welfare, although a statistical authority, has no right to collect death certificates issued elsewhere but in the Forensic Medicine Department of THL. The Personal Data Act requires that register descriptions are produced and made publicly available of all person registers. Statistics Finland is the registered data controller of CoD registry in Finland.

In delivery for Objective 4, we have listed legislative working groups, laws and stakeholders we need to reflect on this matter. It has been proposed the archive of all Finnish death certificates to be relocated in THL, instead of Statistics Finland or KanTa Repository, as we already hold a mandate to digitally archive all data recorded in the Forensic Medicine Information System of ours. By executing the enhancement proposal we would overcome the problem of having two different archives of death certificates in Finland.

Archiving Electronic Death Certificates

In accordance with the present Act 459/1973 and the present Decree 948/1973, all cause-of-death investigations, including statistical reporting and archiving of death certificates, must be properly collected and reported. [9]

Statistics Finland maintains the Finnish archive of death certificates. The archive contains the death certificates of Finnish residents since 1936. Copies of death certificates and unit level data on causes of death are released from the archives for the purposes specified in the Act on the Inquest into the Cause of

Death (459/1973). These purposes cover the releasing of data to 1) the deceased person's next of kin, 2) a pension institution or to the authorities, 3) for scientific research or statistical surveys. [9]

Statistics on causes of death are published annually and compiled from data obtained from death certificates. The data are supplemented with and verified against data from the Population Information System of the Population Register Centre. The statistics on causes of death cover the persons who have died in Finland or abroad during the calendar year and who at the time of death were domiciled in Finland. [9]

All death certificates in Finland are archived in Statistics Finland. THL submits death certificates further to Statistics Finland for use of CoD statistics and archiving.

Using Data of Electronic Death Certificates

Statistics on causes of death (COD) provide information on mortality patterns and form a major element of public health information. The coding of death certificates produces an underlying cause and, for many deaths, one or more associated causes of death. In April 2011, Commission Regulation (EC) No 1338/2008 was passed and it confirms the variables, specifications and metadata which the EU Member States have to supply as concerns statistics on causes of death. The first reference year to be collected following that regulation was 2011. CoD statistics distinguish information on residents and non-residents. [11] Data are the facts or details from which information is derived. Information helps to understand population differences.

The data of the cause of death statistics are published yearly on the website of Statistics Finland (http://www.stat.fi/til/ter_en.html). StatFin online service provides a free of charge access to Finnish statistical data (http://www.stat.fi/tup/statfin/index_en.html) including CoD statistics. [9]

The CoD statistics are available from 1936. Data from 1936 to 1968 are in paper publications. Data from 1969 are in time-series databases. For licensed customers data are combined and obtained in tailored data collections. A license / permission is always needed for unit-level research data. [9]

Cause of death data are also published in international sources and databases: The Nordic Statistical Yearbook, Health Statistics for the Nordic Countries (http://nowbase.org/da/publications), Eurostat database (http://ec.europa.eu/eurostat) and European Health for All database (http://www.euro.who.int/en/data-and-evidence). [9]

Quality Description of Causes of Death Statistics

Death certificates are received at Statistics Finland sent from National Institute for Health and Welfare (THL). At Statistics Finland death certificates are scanned into picture format. Data are optically read to the database. [9]

The statistical underlying cause of death is determined according to the selection and application rules of the International Classification of Diseases (ICD-10) compiled by the World Health Organization (WHO). The ICD-10 classification is an international classification maintained by the WHO describing causes of death, illnesses, accidents and reasons for using health care services. [9]

The death certificate form, in use in Finland, is confirmed by the Ministry of Social Affairs and Health (STM). The physician records the cause of death on the death certificate as both a code and text specifying the diagnosis. At Statistics Finland, causes of death are coded for the most part on the basis of the diagnosis text. [9]

Processing Data of Death Certificates in Statistics Finland

The Mortality Information System of Statistics Finland is presented in Figure 7. Death certificates are issued by the physician declaring the death. If determining the cause of death requires an autopsy, a death certificate is issued by a forensic pathologist or a medico-legal officer, after the information acquired from the autopsy is complete. The physician issuing the death certificate delivers the certificate to the regional unit of the National Institute for Health and Welfare (THL) where the deceased was resident. A forensic pathologist verifies the correctness of certificates and approved certificates are delivered to Statistics Finland. In addition, the health care unit or the physician has to report the death to the Population

Information System. At Statistics Finland, the death certificate data are compared with data on the deceased obtained from the Population Information System and lists of missing death certificates are sent to THL for monitoring purposes. The process of missing death certificate inquiry is explained in more details in delivery report for Objective 1 (Chapter: Statistics Finland). The data files on causes of death are supplemented with other demographic data from the Population Information System. [9]

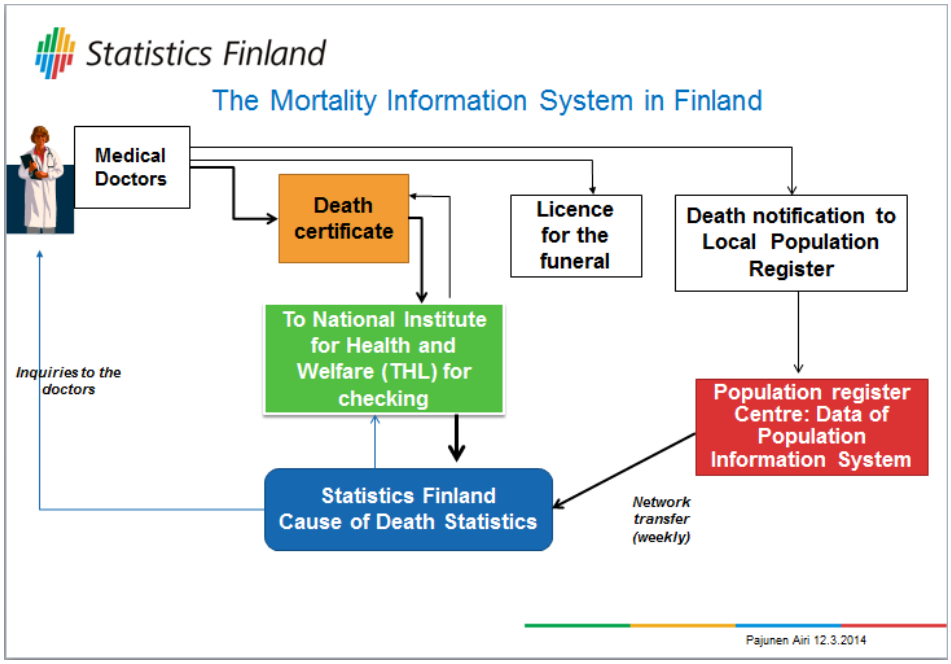

Figure 7. The Mortality Information System of Statistics Finland

Prior to all E-certification of Causes of Death project all death certificates were received at Statistics Finland in paper from THL. Death certificates were scanned at Statistics Finland into picture format and part of the data was read optically to a database. Diagnosis texts and cause of death codes issued by physicians were checked with the help of an electronic dictionary. See Figure 8. [9]

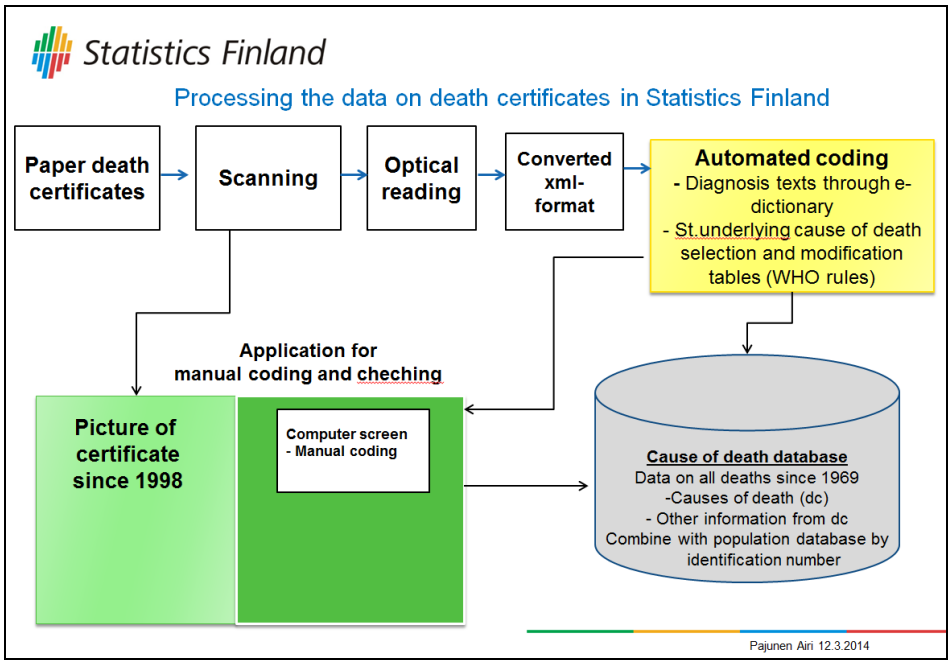

Figure 8. Death Certificate Data Processing – Before the Project

After the end of E-certification of causes of death project, a new process will be taken into use. The new process is outlined in Figure 9.

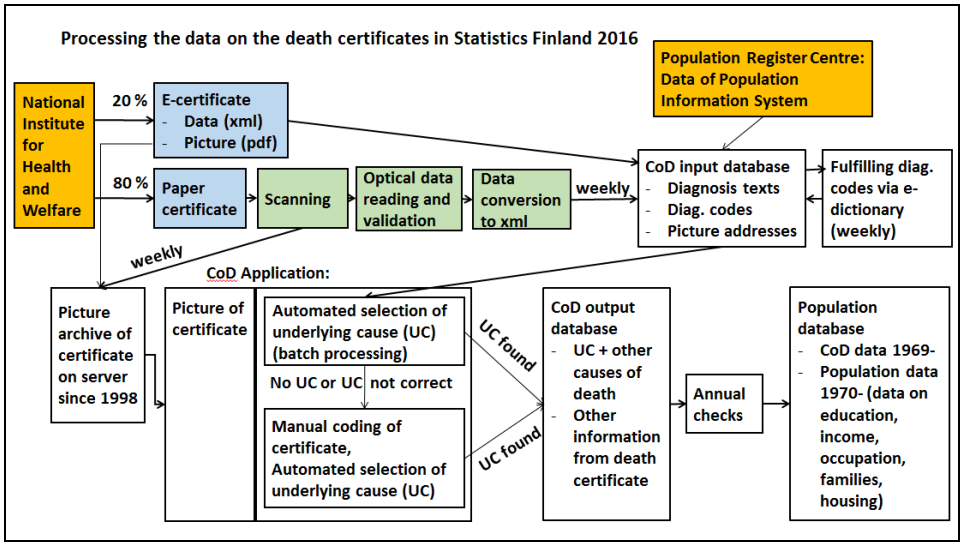

Figure 9. : Death Certificate Data Processing – After the Project

Post Piloting Process Improvement Steps

A lean organization understands customer value and focuses its key processes to continuously increasing the value. As pursuing to continuous improvement and excellence, these values must be adopted into our working culture. As from now, digitalization is in the core of our way of thinking. A new Forensic Information System represents a flagship product enabling electronic death certificates. But, a new tool plus old mindsets will lead to the same old results. The process will not run any faster if the old way of doing things will continue.

A SWOT analysis was formerly presented in the delivery report of Objective 2 (Figure 10) and again in this document (Figure 6). As we went back to them, we noted that there are still significant delays in reporting data, too much paper documents in use and too much variation in ways of working. We decided to do something about it and discovered Lean.

S • Paper forms of death certificate renewed. • Processes defined. • A comprehensive process of death certificate verification in place. • CDA R2 compatible national data structure ready.	W • Delays in reporting data. • Paper archiving. • Missing or wrong information on death certificates. • National legislation to be clarified. • Amount of patient information systems huge. • No access to KanTa. • Patient record system suppliers are privately owned. • Standards and compatibility disorganized.
• The increased manpower of e-certificate project. • Piloting of the Forensic medicine information system in the near future. • Role of THL being a common authority to give regulations. O	• Challenges of electronic digital signature. • Delay of the Forensic medicine information system delivery. • Integrations between stakeholders challenging. • Bad working habits. T

Figure 10. SWOT Analysis post Piloting

The Lean methodology is a systematic method for increasing process speed, striving for a synchronized process flow and eliminating waste in a value stream. By waste here is meant defects, overproduction, transportation, waiting, inventory, motion and processing. [12]

Lean-initiative: Process of Death Certificate

Post pilot process improvement workshop took place in May 18-19. According to the present Act 459/1973, death certificates must be issued as soon as possible after the death and no later than three months after it. Significant delays in the process can be seen as a serious defect.

Lean thinking facilitates a cultural change in an organization. The core idea on Lean thinking is to maximize customer value while minimizing the waste. Eliminating waste along entire value streams creates a process that need less human effort, less space, less capital, and less time to make services than before. The Lean thinking model is presented in Figure 11.

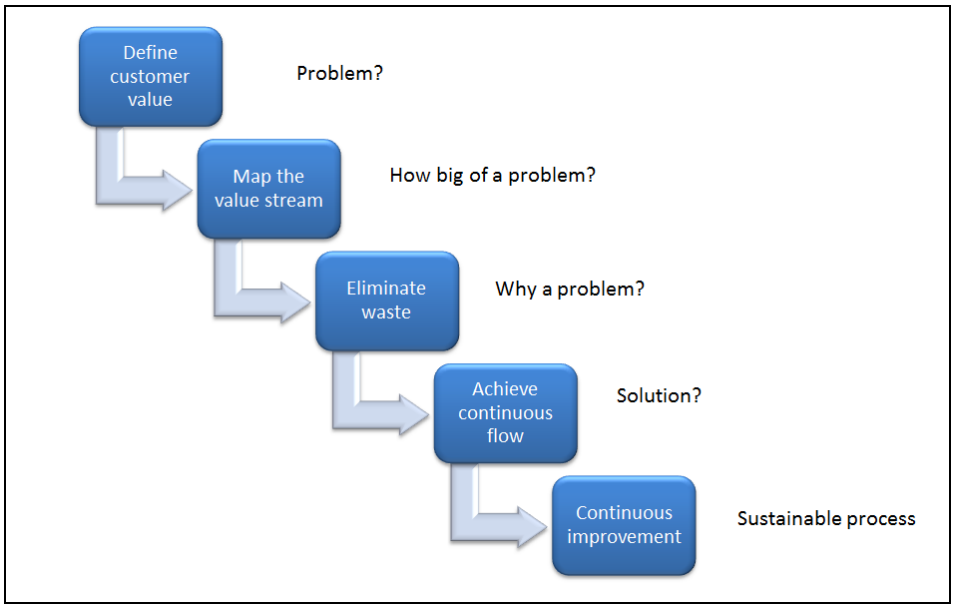

Figure 11. Lean Thinking Model [12]

We analyzed the current process of the Forensic Medicine unit. Our starting point is presented in a SWOT analysis in Figure 6 earlier in this document. Before jumping right into solving a problem, we used some time and effort to improve our understanding of it. Lean has a very extensive collection of tools and concepts to be used.

SIPOC is a tool that summarizes the inputs and outputs of one or more processes in table form. The acronym SIPOC stands for suppliers, inputs, process, outputs, and customers. [12] We used SIPOC for specifying project and its objectives, scoping the process, gathering and defining customer requirements and setting out monitoring metrics for key processes.

Qualitative analyses were done by interviewing people and involving them in change process to increase commitment and motivation. Qualitative data was gathered of autopsy cases within different time frames.

Value Stream Mapping (VSM) is a tool for mapping a production flow. It helps to visualize the current and future states of processes, exposes the waste, and provides a roadmap for future improvements. [12] By finding root causes and brainstorming for solutions we rolled up our sleeves and got hands dirty with the team.

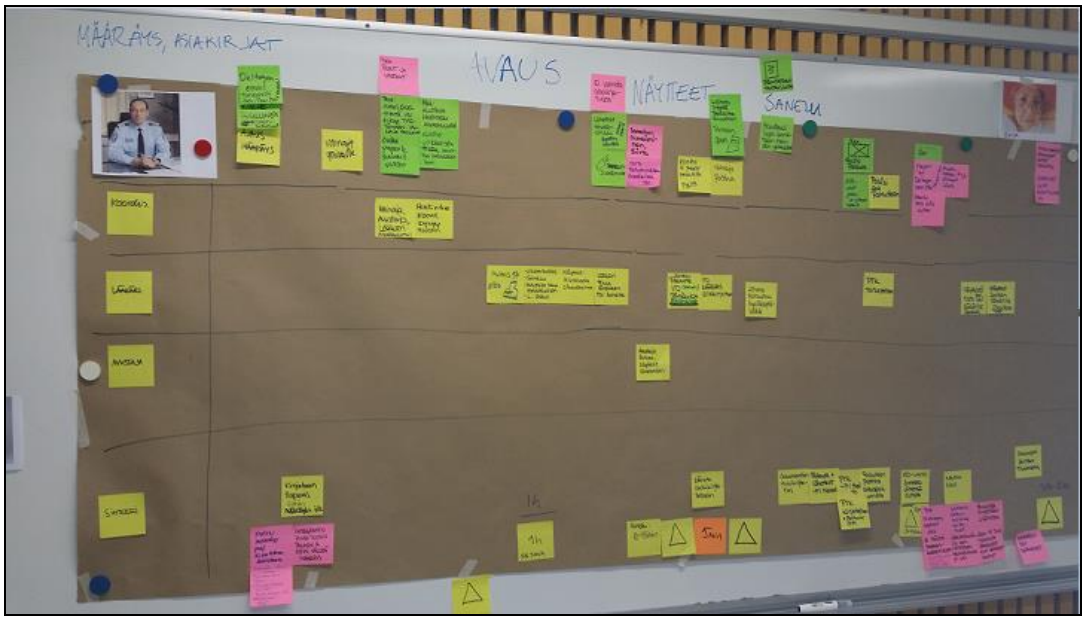

Figure 12. Value Stream Map of Death Certificate Process

An outcome value stream map is presented in Figure 12. Yellow Post-it notes mark process steps, pink ones "obstructions to flow", and green ones suggestions and ideas. At the end of the first workshop day we had a well-stated problem statement ready to be analyzed.

Problem Formulation of Death Certification Process

Around 24 % of all observed cases were late i.e. death certificates were issued later than three months after the death. The period of time observed was the year 2015. This problem results in extra work notably with phone calls (~140 calls / day), and with complaints and outcries received from parties related to autopsy cases (~200 consultations / medico-legal officer / year).

Findings in Death Certification Process

The success measure of our workshops was to achieve the three month lead time of death certificates by identifying the process bottlenecks and concerns. The bottleneck is the creation of the certificate, and:

- There are too many manual steps i.e. non-value added activities that interrupt the flow of work
- All data is not handled electronically
- The transparency and ERP of the process is lacking which makes it difficult to manage the process tasks by doctors and secretaries
- Work performance indicators not broken down into incentives on individual levels
- Despite improvements there are still too many unstructured documents in the information system database
- Critical processes are not managed as an integrated system, meters are set on high level, personal targets are missing
- Too many duplicate values must be filled in the information system
- Data extracted from the system is not reliable.

In our system critical processes are not managed as an integrated system. To improve the system, there are many quick wins we could consider to implement: a single sign logon, digitally signinig multiple documents at once instead of one by one, and adding visual elements and alerts into the system. The FIFO (first in, first out) flow concept is a logical one for a us to follow completing the earliest cases first resulting in a chronological work order and timeliness of the all process.

Metrics to Measure Improvements and Change Initiatives

The data gathered was found to be inadequate, insufficient or not available. A lot of effort was put to evaluation and redefinition of metrics. The following is a list of metrics suggested by the Lean project team to measure the outcomes of a death certification process, identify opportunities for improvement and monitor changes over time. These metrics will help us to pinpoint sources of waste and customer dissatisfaction. By focusing on them we will have tools for finding the root causes of problems, and means for improvement priority setting. We were especially keen on knowing the lead time and idle time of our process. Lead time is the total time from start to finish whereas idle time is the time when useful work is not being performed. In terms of Lean, the backlog is a number of services or products that are waiting for a start in the process [12].

Backlog for physicians:

1. Amount of cases waiting for an autopsy
2. Amount of cases waiting for lab results
3. Amount of cases waiting for autopsy statements (all lab results ready)
4. Amount of cases waiting for an approvement (digital signature)
5. On weekly basis personal objectives visible for follow-up
6. Amount of phone calls tracked
7. Filtering for urgent cases possible.

Backlog for assistive staff:

1. Amount of cases waiting for an autopsy
2. Amount of cases queueing for dictation transcription (categorized by type)
3. Amount of cases waiting for an approvement (digital signature)
4. Amount of cases waiting for autopsy statements
5. Amount of cases marked ready and closed
6. Amount of phone calls tracked.

Each process analysis effort requires decisions about the actions and measures for us to be able to describe the process maturity in any way. In our analysis, both qualitative and quantitative actions were found for death certification process improvement. Proposed actions:

- Efficient use of Clinical Document Architecture (CDA) in Forensic Medicine Information system
- Efficient use of automation and electronic data interchange
- Breakpoints for measurement and monitoring purposes to be defined
- Work routines and responsibilities to be defined and set out i.e. personal incentives
- Daily schedules clear and visible for all employees i.e. calendar views
- Introducing and adopting the FIFO principle
- Adding flexibility into the system in use i.e. digitally signing multiple documents at once.

In a nutshell, the amount of incomplete cases is our backlog is too high. The focus should be to empty the backlog to get the process stabilized. This could be done but will take years (!) depending on actions we choose. At the same time, we must continue developing the Forensic Medicine Information System in a user centered way. Service design is a form of conceptual design that involves activities of planning and organizing people, infrastructure, communication and material components of a service and the interaction between the service provider and its customers. We strongly believe in benefiting the process analysis done and are fully engaged to making improvements across the unit. However, final results are not to be seen immediately but in future.

References

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[3] http://vrk.fi/. 2016. Certificates - FINeID - Population Register Centre . [ONLINE] Available at: http://vrk.fi/en/certificates-fineid. [Accessed 27 May 2016].

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[7] 159/2007 - Säädösmuutosten hakemisto - FINLEX ®. 2016. 159/2007 - Säädösmuutosten hakemisto - FINLEX ®. [ONLINE] Available at: http://www.finlex.fi/fi/laki/smur/2007/20070159. [Accessed 27 May 2016]. (in Finnish)

[8] 2016. Certification | IT and connection operators | Kanta.fi. [ONLINE] Available at: http://www.kanta.fi/en/web/ammattilaisille/sertifiointi. [Accessed 07 July 2016].

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[11] What is Lean? 2016. What is Lean? [ONLINE] Available at: http://www.lean.org/WhatsLean/. [Accessed 27 May 2016].

[12] Causes of death - Eurostat. 2016. Causes of death - Eurostat. [ONLINE] Available at: http://ec.europa.eu/eurostat/web/health/causes-death. [Accessed 27 May 2016].

Appendices

Appendix 1: Printout of an e-Death Certificate (in Finnish)

KUOLINTODISTUS
28 vrk:n ikäisestä tai vanhemmasta

Lisäsivuja kpl: 0

1. Sukunimi	2. Etunimet	3. Vakituinen asuinmaa
Testi_Sukunimi	Testi_Etunimi	Suomi

4. Henkilötunnus	5. Kuolinaika	6. Viimeinen kotikunta	7. Maistraatti
111295-9874	11.12.2015 10:00 ☐ varma ☑ arvioitu	Helsinki	Helsingin maistraatti

8. Kuolemansyyt 8.1. Kuolemaan johtaneet taudit, vammat, myrkytykset ja ulkoiset syyt	Syykoodi[1] tai Ulkoinen syy[3]	Oirekoodi[2] ja/tai Tärkein vamma[4]	Lääkeainekoodi (ATC)	Oletettu sairauden kesto
A a. Välitön kuolemansyy (ei tarkoita kuolemisen viime vaiheen tapaa)	C17.0&	C78		
B b. Välivaiheen kuolemansyy/-syyt				
C c. Peruskuolemansyy (ehdottomasti täytettävä) laajalle levinnyt ja etäpesäkkeitä lähettänyt pohjukaissuolen syöpä	C17.0&	C78		
8.2. Muut kuolemaan myötävaikuttaneet merkittävät sairaudet, vammat ja tilat				
suolen tukkeuman vuoksi tehdyn toimenpiteen jälkitila ja suolisauman repeämä, paikallinen vatsakalvontulehdus		K65.0 T88.8		
oikeanpuoleinen keuhkoverituppa	I26.9			

9. Kuolemanluokka — Määräytyy kohdan 8.1c peruskuolemansyyn mukaan
☑ Tauti ☐ Ammattitauti ☐ Tapaturma ☐ Lääketieteellinen hoito tai tutkimustoimenpide ☐ Itsemurha ☐ Henkirikos ☐ Sota ☐ Epäselvä

Päivämäärä, jolloin kuolemasta on ilmoitettu poliisille, jos kyseessä ei ole tauti:

10. Kun kuolemanluokka on tapaturma, tapaturman paikka
☐ Liikenne/kuljetus ☐ Koti ☐ Terveydenhuollon palveluyksikkö ☐ Sosiaalihuollon palveluyksikkö
☐ Muu, mikä? ☐ Ei tiedossa

11. Kun kuolemanluokka on tapaturma, toiminta tapaturman sattuessa
☐ Ansiotyö ☐ Urheilu/liikunta ☐ Vapaa-aika ☐ Muu, mikä? ☐ Ei tiedossa

12. Kuolinpaikka
☑ Terveydenhuollon palveluyksikkö, mikä? seinäjoen keskussairaala
☐ Koti/asunto ☐ Muu, mikä? ☐ Sosiaalihuollon palveluyksikkö, mikä? ☐ Ulkomailla, missä?

12.1. Kunta, jossa kuolema on tapahtunut: Seinäjoki

13. Tapahtumatiedot — Tässä annetut tiedot perustelevat kohdassa 8 ilmoitetut kuolemansyyt ja kohdan 9 kuolemanluokan.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis egestas enim in tempus lobortis. Sed commodo enim et aliquet luctus. Morbi interdum rhoncus finibus. In maximus et ex at efficitur. Aenean finibus non leo et vulputate. Vivamus vel mauris ut orci facilisis tincidunt. Curabitur sollicitudin magna sit amet velit ornare, nec consequat mauris ornare. Cras tincidunt aliquam ligula, elementum vehicula lacus sagittis a. Cras auctor sodales ipsum sed dictum. Aenean id aliquam lorem. Etiam feugiat, lectus et tempus rutrum, eros lacus pulvinar purus, vitae maximus arcu nunc nec felis.

14. Kuolemansyyn selvittämistapa:
☐ Lääketieteellinen kuolemansyyn selvitys, ei ruumiinavausta
☐ Lääketieteellinen kuolemansyyn selvitys, ruumiinavaus
☐ Oikeuslääketieteellinen kuolemansyyn selvitys, ei ruumiinavausta
☑ Oikeuslääketieteellinen kuolemansyyn selvitys, ruumiinavaus
Ruumiinavauspaikka: Helsingin toimipiste
Ruumiinavauksen tunniste: 2015-00014

15. Kuolintodistuksen tiedot vakuutan kunniani ... omantuntoni kautta — Kukin lomake allekirjoitetaan erikseen.

Paikka ja aika	Lääkärin allekirjoitus	16. Terveydenhuollon toimintayksikön tunnus
Helsinki, 26.05.2016	Asiakirja on sähköisesti allekirjoitettu.	
Virkapaikka: Terveyden ja hyvinvoinnin laitos, Oikeuslääkintäyksikkö Helsinki	Nimen selvennys: Korpisaari, Pia Anneli	1.2.246.10.22295006.10.1
Puhelin: 029 524 8076 / Faksi: 029 524 8062	Virka-asema: oikeuslääkäri	Lääkärin yksilöintitunnus: 999999

Digitally signed

1. signature of an issuer

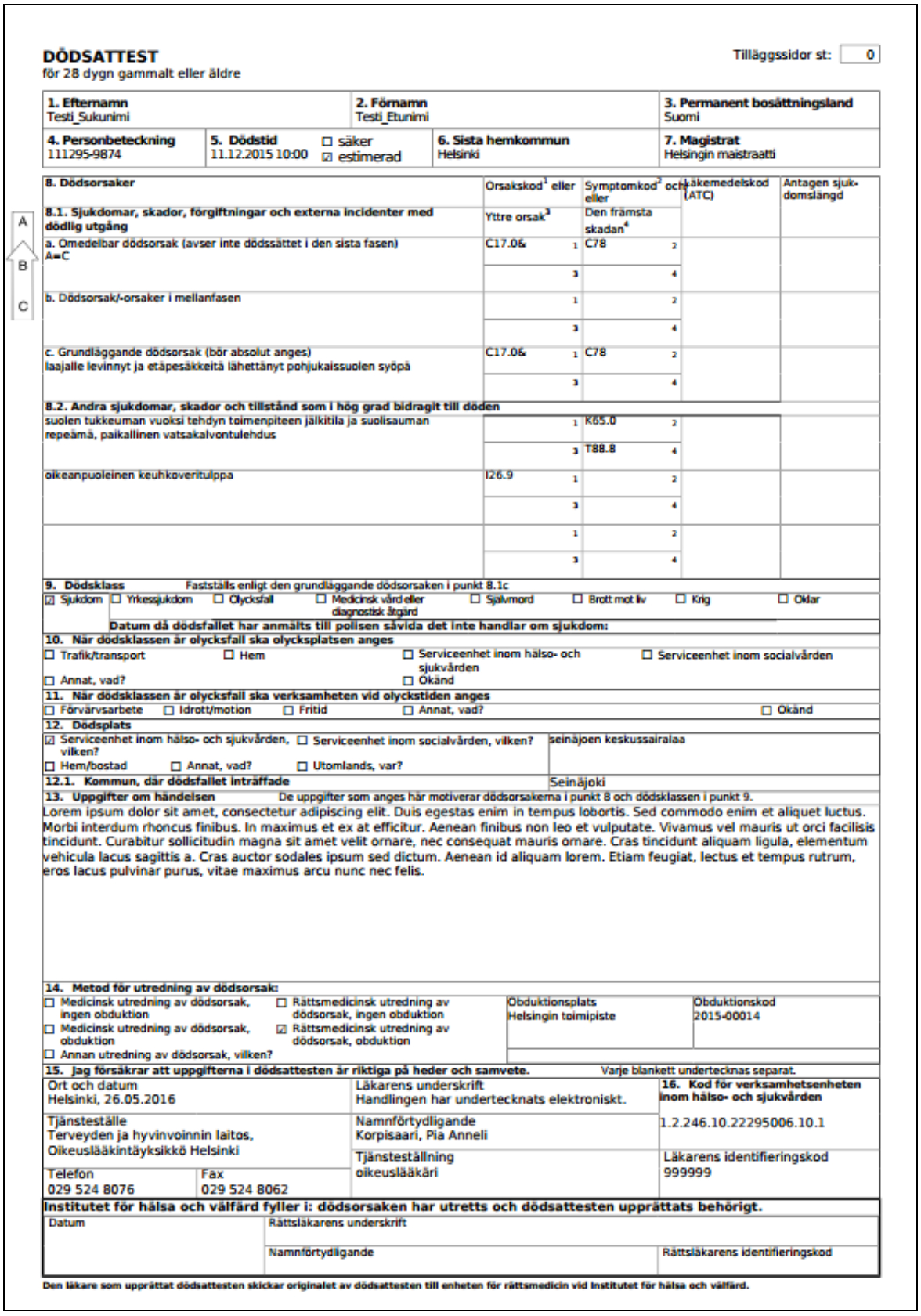
Terveyden ja hyvinvoinnin laitos täyttää: kuolemansyy on selvitetty ja kuolint...

Päiväys	Oikeuslääkärin allekirjoitus
	Oikeuslääkärin yksilöintitunnus

2. signature when approved

Kuolintodistuslomake 05.2013

Appendix 2: Printout of an e-Death Certificate (in Swedish)



DÖDSATTEST
för 28 dygn gammalt eller äldre

Tilläggssidor st: 0

1. Efternamn	2. Förnamn	3. Permanent bosättningsland
Testi_Sukunimi	Testi_Etunimi	Suomi

4. Personbeteckning	5. Dödstid	6. Sista hemkommun	7. Magistrat
111295-9874	11.12.2015 10:00 ☐ säker ☑ estimerad	Helsinki	Helsingin maistraatti

8. Dödsorsaker	Orsakskod[1] eller	Symptomkod[2] och/eller	Läkemedelskod (ATC)	Antagen sjukdomslängd
8.1. Sjukdomar, skador, förgiftningar och externa incidenter med dödlig utgång	Yttre orsak[3]	Den främsta skadan[4]		
a. Omedelbar dödsorsak (avser inte dödssättet i den sista fasen) A=C	C17.0& 1	C78 2		
	3	4		
b. Dödsorsak/-orsaker i mellanfasen	1	2		
	3	4		
c. Grundläggande dödsorsak (bör absolut anges) laajalle levinnyt ja etäpesäkkeitä lähettänyt pohjukaissuolen syöpä	C17.0& 1	C78 2		
	3	4		
8.2. Andra sjukdomar, skador och tillstånd som i hög grad bidragit till döden				
suolen tukkeuman vuoksi tehdyn toimenpiteen jälkitila ja suolisauman repeämä, paikallinen vatsakalvontulehdus	1	K65.0 2		
	3	T88.8 4		
oikeanpuoleinen keuhkoveritulppa	I26.9 1	2		
	3	4		
	1	2		
	3	4		

A
B
C

9. Dödsklass Fastställs enligt den grundläggande dödsorsaken i punkt 8.1c

☑ Sjukdom ☐ Yrkessjukdom ☐ Olycksfall ☐ Medicinsk vård eller diagnostisk åtgärd ☐ Självmord ☐ Brott mot liv ☐ Krig ☐ Okär

Datum då dödsfallet har anmälts till polisen såvida det inte handlar om sjukdom:

10. När dödsklassen är olycksfall ska olycksplatsen anges

☐ Trafik/transport ☐ Hem ☐ Serviceenhet inom hälso- och sjukvården ☐ Serviceenhet inom socialvården
☐ Annat, vad? ☐ Okänd

11. När dödsklassen är olycksfall ska verksamheten vid olyckstiden anges

☐ Förvärvsarbete ☐ Idrott/motion ☐ Fritid ☐ Annat, vad? ☐ Okänd

12. Dödsplats

☑ Serviceenhet inom hälso- och sjukvården, vilken? ☐ Serviceenhet inom socialvården, vilken? seinäjoen keskussairaalaa
☐ Hem/bostad ☐ Annat, vad? ☐ Utomlands, var?

12.1. Kommun, där dödsfallet inträffade Seinäjoki

13. Uppgifter om händelsen De uppgifter som anges här motiverar dödsorsakerna i punkt 8 och dödsklassen i punkt 9.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis egestas enim in tempus lobortis. Sed commodo enim et aliquet luctus. Morbi interdum rhoncus finibus. In maximus et ex at efficitur. Aenean finibus non leo et vulputate. Vivamus vel mauris ut orci facilisis tincidunt. Curabitur sollicitudin magna sit amet velit ornare, nec consequat mauris ornare. Cras tincidunt aliquam ligula, elementum vehicula lacus sagittis a. Cras auctor sodales ipsum sed dictum. Aenean id aliquam lorem. Etiam feugiat, lectus et tempus rutrum, eros lacus pulvinar purus, vitae maximus arcu nunc nec felis.

14. Metod för utredning av dödsorsak:

☐ Medicinsk utredning av dödsorsak, ingen obduktion ☐ Rättsmedicinsk utredning av dödsorsak, ingen obduktion
☐ Medicinsk utredning av dödsorsak, obduktion ☑ Rättsmedicinsk utredning av dödsorsak, obduktion
☐ Annan utredning av dödsorsak, vilken?

Obduktionsplats: Helsingin toimipiste
Obduktionskod: 2015-00014

15. Jag försäkrar att uppgifterna i dödsattesten är riktiga på heder och samvete. Varje blankett undertecknas separat.

Ort och datum	Läkarens underskrift	16. Kod för verksamhetsenheten inom hälso- och sjukvården
Helsinki, 26.05.2016	Handlingen har undertecknats elektroniskt.	
Tjänsteställe Terveyden ja hyvinvoinnin laitos, Oikeuslääkintäyksikkö Helsinki	Namnförtydligande Korpisaari, Pia Anneli	1.2.246.10.22295006.10.1
Telefon 029 524 8076 / Fax 029 524 8062	Tjänsteställning oikeuslääkäri	Läkarens identifieringskod 999999

Institutet för hälsa och välfärd fyller i: dödsorsaken har utretts och dödsattesten upprättats behörigt.

Datum	Rättsläkarens underskrift	
	Namnförtydligande	Rättsläkarens identifieringskod

Den läkare som upprättat dödsattesten skickar originalet av dödsattesten till enheten för rättsmedicin vid Institutet för hälsa och välfärd.

Pia Korpisaari

Objective 4: National Plan for the Introduction of Electronic Death Certificate

Deliverable for Objective 4
June 2016

Overview

Electronic death certification a fully electronic certification of the medical certificate of cause of death (CoD), i.e. the certifier completes and signs off an electronic form. The form is electronically sent to the relevant authorities.

Mortality statistics are essential for monitoring public health. To ensure that these statistics are of good quality, doctors need to emphasize correct completion of the death certificate and they must understand the true cause of death. [1]

Cause-of-death statistics are widely used for comparing health characteristics of European Community (EC) countries. Eurostat decided to address globally this problem with the objective to improve quality and comparability of cause-of-death data within the EC. [2]

The ultimate objective of Eurostat for this work is to comply with the WHO guidelines and Eurostat CoD task force recommendations, to fasten the national process from issuing, verifying, archiving of death certificates to statistical production, and to improve the overall quality of death certificates.

According to a French study, electronic death certificates are better completed than paper death certificates. Patient privacy is a major issue for today's healthcare providers. There are three main objectives for information technology security: confidentiality, integrity, and availability of data. Confidentiality is protecting access to sensitive data from those who don't have a legitimate need to use it. Integrity is ensuring that information is accurate and reliable and cannot be modified in unexpected ways. The availability of data ensures that is readily available to those who need to use it. [3] [4]

Electronic Death Certification (EDC) is a jointly funded action by the European Commission and the National Institute for Health and Welfare (THL) based on the EC Grant Agreement number 07154.2013.002-2013.626. The THL diary number for the action is THL/1802/6.00.00/2013. The action aims to improve the quality of CoD statistics and to strengthen the development of electronic tools, processing and data sharing for statistical purposes.

The European Commission has awarded a grant "E-certification of causes of death" for National Institute for Health and Welfare to achieve substantial results:

- A good overview of the current national situation on death certification
- Tools and practices for handling of electronic cause of death information
- A 20 % share of death certificates to be issued electronically after the action
- A detailed plan to help achievement of 100 % electronic death certificate rate.

Digitalization – a Change in Operating Environment

According to the Finnish Government, Finland's competitiveness is built on high expertise and innovations. The Government encourages a culture of experimentation and boosts digitalization as they are main drivers of our times for both business and research. In order to pursue these objectives we should strive to resolve all unnecessary regulations and bureaucracy. To help us better understand and find the best way from insight to foresight, we need to provide insight into WHY things happen, and provide foresight to see WHAT lies ahead. [5]

WHY – National Megatrends, Weak Signals and Big Data

Megatrends can be seen as an interpretation of the directions of global change-related phenomena. Sitra, a Finnish innovation fund operating directly under the Finnish Parliament, has published a list of megatrends reflecting future and societal changes. Sitra uses a trends list as a basis for discussion of changes and phenomena having a major impact on Finland. Three major forces of change are to be seen: ever-accelerating technological development, global interdependency with growing tensions, and the

sustainability crisis linked to the use of natural resources and climate change. They all affect our world in the field of economy, organizations and individuals. [6]

Open access to information will continue to empower bottom-up innovation processes by opening new routes for knowledge creation. At the same time, access to information and user rights, are becoming more fiercely contested by corporate and private interests. [7]

Big Data Analytics is nationally a significant change driver influencing our information technology and telecommunications, level of education and government support for corporate research and development. [8]

WHY – The Strategy of National Institute for Health and Welfare

The strategy of National Institute for Health and Welfare (THL) has recently been updated, and highlights organizational reforms, revised priorities, and changed prospects in our work. According to our new strategy we work in cooperation with our partners, value user satisfaction with our meaningful products and strive to our goals by motivated personnel. [9]

One of THL's strategy goals is to bring efficiency to the use of our datasets and to be a forerunner in the production, distribution and integration of data. THL's data policy is a tool promoting the efficient use of our datasets, designed for use by both the management and the people working with data. THL's data policy entails a promise to make datasets more timely and relevant, and improve custom reporting. Data collection coordination will be boosted by striving to a single source of data. [10]

WHY – Open Science and eHealth in Finland

Finland has been involved in long-term development of its eHealth systems and services, developing from a mainly localized approach towards a more national approach. Attention should be paid in benefits of local ownership and flexibility pursuing structure of information sharing and standardization. Finland has encouraged digital documentation resulting in paperless health care domains. There is a strategic change program occurring in Finland that provides a compelling vision of integrated healthcare. [11]

Finland has a wide diversity of components in terms of eHealth for supporting its health and social system. Almost all records are "electronic from birth". Today, the country has direct access to a source of either valuable information or resources, particularly when taking into account the long history of registers and secondary use of data from routine health care. However, there appears to be insufficient focus in Finland on the context of care itself, and on the services such as new care pathways, chronic disease management, and patient empowerment which will contribute to the necessary modernization of the health care system. [11]

The Ministry of Education and Culture of Finland has launched the Open Science and Research Initiative (ATT) for the promotion of research information availability and open science platform for the years 2014-2017. The initiative will implement the national policy agenda in a way that fosters the Finnish research system towards better competitiveness and higher quality, transparency and innovation. [12]

WHY – Global Megatrends

The EU Digital Agenda highlights that for eHealth technologies to be successful it is essential to "incorporate the right of individuals to have their personal health information safely stored within a healthcare system accessible online". [13] Technological change entails risks and opportunities. These include in particular the emerging cluster of nanotechnology, biotechnology, and information and communication technology aka NBIC. [14][15]

WHAT – National Architecture for Digital Services (KAPA)

X-road has allowed Estonia to build a state portal website that serves as a "one-stop-shop" for all the different e-services provided by government departments, from healthcare and welfare to education and population registers. Citizens, entrepreneurs and officials are directed to their own portal sections. Estonia's X-road concept for allowing the nation's various e-service databases to link up and operate harmoniously has also been recognized in Finland. [16]

X-Road is the all-important connection between databases, the tool that allows them to work together for maximum impact. All of the Estonian e-solutions that use multiple databases use X-Road. All outgoing data from the X-road is digitally signed and encrypted. All incoming data is authenticated and logged. [17]

Public and private sector enterprises and institutions can connect their information system with X-Road. Joining the X-Road enables institutions to save resources, since a cooperative and secure data exchange layer already exists with all the other X-Road members. Data exchange between all the members of the X-Road ecosystem is significantly more efficient. [17]

The National Architecture for Digital Services (KAPA), based on X-road technology, will be a compatible infrastructure facilitating information transfer between organizations and services. The program involves creating a national data exchange layer, the shared service views required by citizens, companies and authorities, a new national e-identification model and national solutions for the administration of roles and authorizations for organizations and individuals. [18][19]

WHAT – Open Data Program

The Finnish Open Data Program 2013–2015, set up by the Ministry of Finance, finished at the end of June 2015. It promotes open data becoming a regular part of administrative activity. In the opening of public information resources, the emphasis will shift to utilizing data and strengthening information skills as part of the digitalization of administration. The objective of the Finnish Open Data Program has been to accelerate the opening of information resources free of charge and with transparent conditions of use to various players. The goal is to create conditions for new business activity and innovations, strengthen democracy and civil society, enhance administration, and diversify the information resources available to education and research. [20]

In Finland, opening of information resources has been prepared as part of the planning of the central government spending limits and nowadays as part of the general government fiscal plan. A growing number of municipalities are also opening their data. To support the opening of central government and local government data, the Ministry of Finance and the Association of Finnish Local and Regional Authorities are cooperating on the preparation of a manual, the first parts of which will be published in late autumn 2015. [20]

By combining health registries, state registries, public health registries and clinical data repositories, and exchanging electronic health information we can assess clinical performance and shared characteristics and risks of diseases. The eHealth Network is a voluntary network, set up under article 14 of Directive 2011/24/EU. It provides a platform of Member States' competent authorities dealing with eHealth. [21]

WHAT – National Health Data HUB by Sitra

The digital health hub in Finland, Isaacus, is meant to connect and distribute health data in a secure way. In 2015, Sitra launched a set of projects to combine wellbeing data from various sources. From a single access point, Isaacus will provide data concerning well-being – such as patient, demographic and lifestyle data – and open data gathered from various registers and sources. When gathering and processing this data, special attention will be paid to the protection of privacy, data security and the individual as the key decision-maker on what the data is used for and by whom. [22][23]

WHAT – Code Server

The Code Service maintained by THL manages the preparation, distribution and maintenance of nationally uniform social and health care code sets, classifications, terminologies, form structures and coded data specifications. Over 200 code sets have been published on the code server. Maintaining the code sets requires expert groups that consist of customers, interest groups and experts on the subject of a certain code set. Description and clarification of core functions, development of operations model, creation of quality and process indicators and change management of internal activities are the main goals of Code Service. [24]

The Finnish Health Care System

A residence based system ensuring universal and equal rights to all citizens is a basis of the Finnish healthcare system. Local authorities are responsible for organizing primary health care and specialized medical care. Public services in Finland are funded by tax revenues collected by the state and municipalities. [25][26]

Stakeholders and Networks

Problem with digitalization in Finland lies on fragmentation of our public sector, lack of cooperation across organizational borders, overlapping innovation programs and the rigidity of our legislative body.

National Institute for Health and Welfare (THL)

The National Institute for Health and Welfare (THL) is a research and development institute under the Finnish Ministry of Social Affairs and Health. THL is subject to the performance guidance of the Ministry. THL operations are governed by the relevant Act and Decree. [27]

The three main functions of THL are to promote the welfare and health of the population, to prevent diseases and social problems and to develop social and health services. THL pursues and carries out its objectives by means of research, development activities, official tasks, steering through information as well as international co-operation. In its capacity as the statutory statistical authority for health and welfare, THL maintains and promotes the use of a strong knowledge base within the field. [27]

Since 1 January 2011, the operational management of electronic information management in social services and health care has been conducted by the National Institute for Health and Welfare (THL) where a Unit for the Operational Management of Health and Welfare Information (OPER) was set up in the Information Department. The Finnish Ministry of Social Affairs and Health (STM) steers the operations with the aid of a framework agreement and annually prepared action plans. [27]

Statistics Finland

Founded in 1865, Statistics Finland is the only Finnish public authority specifically established for statistics. It produces the vast majority of Finnish official statistics and is a significant international actor in the field of statistics. Statistics Finland combines collected data with its own expertise to produce statistics and information services. Statistics Finland supports democratic decision-making based on facts, as well as scientific research by producing reliable statistics, studies and datasets describing society. Statistics Finland develops the national statistical service in co-operation with other Government officials. [28]

KELA

KELA, the Social Insurance Institution of Finland, operates under the supervision of Parliament. The legal status, responsibilities and administrative structure of KELA are defined in the Act on the Social Insurance Institution. Its responsibilities in the area of social protection are defined in a range of Acts of Parliament concerning specific benefits. KELA's mission is to secure the income and promote the health of the entire nation, and to support the capacity of individual citizens to care for themselves. KELA is a reliable, efficient and socially responsible actor. It has an active role in developing social security and its implementation. The social security provided by KELA is clearly understandable, reasonable in amount and delivered with a good standard of quality. [29]

Population Register Centre (VRK)

The basic task of the Population Register Centre (VRK) is to enable usage of the data contained in the Population Information System and its certified electronic services to support society's functions and information services and management. Through its activity, the Population Register Centre promotes the

protection of privacy and personal data as well as information security and the development of and compliance with good data processing and data management practices. [30]

Local Register Offices

Local register offices are local state administrative authorities. There are 11 local register offices in Finland. The operational area of each local register office is comprised of one or more jurisdictional districts. In addition, the local register offices have a number of service units in order to ensure that its services are as available to the public as possible. The local register offices are responsible for maintaining their regional Population Information System and their local information services, as well as the guardianship authority. Other services offered by the local register offices include notary public services, the investigation of impediments to marriage and performances of civil marriages, name changes and the confirmation of the list of parties to estate inventories. [31]

Ministry of Social Affairs and Health (STM)

The Ministry of Social Affairs and Health is part of the Finnish Government. It is in charge of the planning, steering and implementation of social and health policy. The goal of the Ministry of Social Affairs and Health is to ensure that everyone has an equal opportunity to lead a healthy and socially secure life. The ministry's mission is to promote healthy, disability-free life, a healthy working and living environment and gender equality as well as to secure sufficient social and health care services and a decent income at different stages of life. [32]

The Ministry of Finance (VM)

The Ministry of Finance is a part of the Finnish Government. The Ministry prepares the Government's economic and financial policy as well as the budget, and acts as a tax policy expert. It is also responsible for preparing the financial market policy, the state's employer and personnel policy and developing public administration. In addition, the Ministry of Finance is responsible for developing the local government legislation as well as local government finances. The Ministry participates in the activities of the European Union as well as several international organizations and financial institutions. National Architecture for Digital Services (KAPA) and Open Data Program are projects currently underway in the Ministry of Finance. [20][33][34]

Valvira

Valvira is a national agency operating under the Ministry of Social Affairs and Health (STM), charged with the supervision of the social and health care, alcohol and environmental health sectors. They provide licensing for social and health care providers and offer guidance to the Regional State Administrative Agencies to achieve harmonized licensing, guidance and supervisory practices throughout Finland. [34]

Valvira is tasked with providing guidance to the Regional State Administrative Agencies on all social and health care related matters. They aim to ensuring the harmonization of guidance, licensing and supervisory practices across Finland. Valvira and the Regional State Administrative Agencies undertake supervisory activities on the basis of jointly prepared supervision plans. [35]

Patient Record System Providers

Patient Information Systems aka Patient Record Systems are designed to improve access to patient information through a central electronic information system. Traditionally all information is maintained in a paper format in internal systems. Electronic systems help to collect and save all patient related data in one place aiming to increasing effectivity, safety of patients and customer satisfaction in an organization. A flexible system will adapt to changing needs of all stakeholders. In Finland the use of patient information systems is not enforced, but highly encouraged, by the state. There are tens of patient record system providers in Finland. [Delivery Report for Objective 2]

Akusti

The Association of Finnish Local and Regional Authorities (Kuntaliitto) seeks to promote the opportunities of the local government sector to make efficient use of ICT. The Association promotes the interoperability of the public sector information technology, develops the joint use of various data pools and supports the development of multichannel services across sectoral borders. Akusti is a new national level organization unit started in 2014 to establish and coordinate the cooperation between state, regions and municipalities in cooperation within the Association of Finnish Local and Regional Authorities. [34] [36]

Projects and Facilities

Finland and its health care related projects require first-class ICT infrastructure and adequate capacity. Healthcare business is a challenge due to converging ICT and medical technology. Reliable and scalable network solutions are needed in integrated ecosystems. The cooperation and transfer of health information should be countrywide flexible and effective.

Enterprise Architecture in Finland

Information systems in public administration are complex and often difficult to develop. To retain control over the strategic direction of IT operations, the Ministry of Finance has selected and put emphasis on expanding Enterprise Architecture in the public sector in Finland, to provide a proven set of tools and methods to deal with this complexity. The Enterprise Architecture is focusing on the whole life-cycle of processes, information and systems, and is executed as a collection of letters of recommendation, standards and regulations. The focus is to turn local organizations with local systems into regional multi organization shared systems. The Act on Information Management Governance in Public Administration (634/2011) aims to ensuring interoperability of public information systems. [34][37][38]

The Ministry of Finance (VM) drives the modeling the action-oriented and strategy based enterprise architecture work. It also has a governing role for common services. The execution is the responsibility of all public sector organizations. [38]

Patient Information Systems

In Finland, special and primary health care units in both public and private sectors have tens of different patient information systems in use. Every service provider had its own patient record system without interoperability with each other. Patient Information Systems aka Patient Record Systems are designed to improve access to patient information through a central electronic information system. Traditionally all information is maintained in a paper format in internal systems. Electronic systems help to collect and save all patient related data in one place. [39]

Health System Data in Finland

All major health care providers (hospitals, primary health care units, pharmacies) annually deliver person-level data collected and abstracted from their patient administration systems to government agencies who are by law the responsible register keepers. The National Institute for Welfare and Health (THL), the Social Insurance institution of Finland (KELA), Statistics Finland and the Finnish Institute of Occupational Health (TTL) are the central sources of health system data. Individual level data can be linked using the unique and national personal identification code. Data linkage is allowed only if a researcher has permission from the authorities. The Finnish Information Centre for Register Research maintains a web site which contains information on register controller organizations. [40]

By application, Statistics Finland can release data included in death certificates on individual level for scientific research and statistical surveys in compliance with the provisions of the Act on the determination of cause of death and the Act on the Openness of Government Activities. In order to obtain the data a written permission to use data files must be requested from Statistics Finland. Where needed, cause of death data and/or copies of death certificates can be released. The data and copies of death certificates for research purposes are subject to payment. [41]

Parliament decided in December 2006 that a statutory nationwide electronic patient record (EPR) system and nationwide electronic prescription system will be introduced in Finland following a four year transition period. Currently, every service provider has chosen their patient record system individually and systems are usually inconsistently connected to each other. A pilot program of EPR and with it linked national electronic prescription system was implemented between 2003 and 2006. Together these systems form the KanTa repository. [7][42]

KanTa Repository and Messaging Interface

The national data system for healthcare services, pharmacies and citizens in Finland is called KanTa (The National Archive of Health Information). Services include electronic prescriptions, Pharmaceutical Database, My KanTa pages, and Patient Data Repository. Services are deployed in phases throughout Finland. In future, patient information entered in a structured form with shared code products could also be used for the automation of functions such as statistical reporting. [7]

In the KanTa system all national healthcare information is stored and managed in a centralized system. To access the centralized system, KanTa provides a unified messaging interface based on HL7 v3 messaging to transport HL7 CDA R2 documents. The security of the received messages is controlled by the authentication and access control layer. Authentication and digitally signed XML documents are based on the public key infrastructure (PKI) using smartcards. Communication between servers is protected by secure sockets layer (SSL) connections. [43]

Apotti

Apotti is an extensive change project of the social services and healthcare field. Project participants include the local governments in Helsinki region, and the Hospital District of Helsinki and Uusimaa (HUS). The central objective of this project is to build a regionally cohesive social services and healthcare system providing citizens and professionals with up-to-date data. Apotti aims to developing health operations and increasing their quality. [44]

UNA

UNA project is closely related to Apotti project. It involves requirement specification part of organization and system supplier independent patient information systems. The project stands for a user-centered design process introduced in delivery for Objective 2. User-centered design (UCD) is an approach that involves end-users throughout the development process so that technology support tasks are easy to operate, and are of value for the users. UNA and Apotti belong to AKUSTI project portfolio. [45]

Kelain

Kelain is an online prescription service implemented by KELA to enable the issuing and processing of electronic prescriptions. The service is aimed at social and health care professionals and, in the initial stage, at physicians and dentists who do not have a patient data system or prescription application at their disposal. The service is currently being designed and implemented and it will be introduced during 2016. The service is developed in cooperation with, e.g. the Ministry of Social Affairs and Health (STM), the National Institute for Health and Welfare (THL) and the Finnish Medical Association in order to achieve high availability. [46]

Kelain is a good alternative for private use by physicians and dentists when they are self-employed or employed by a healthcare service. Kelain can be accessed by registering as a user. Registration takes place directly in the service when you first take it into use. [46]

Legislation + National Rules and Recommendations

Finland has extensive legislation on promoting eHealth and its infrastructure. This document collects some national laws, rules and recommendations that govern, concern and guide us with our ambitious goal of introducing a countrywide electronic death certificate.

Circular No 1789 (Cause-of-Death Determination)

Instructions for the certifiers on how to certify causes of death and how to complete the different parts of the death certificate form are given on the certificate form itself and in Circular No 1789. [47]

Act on Determining the Cause of Death (459/1973)

In accordance with the present Act 459/1973 and the present Decree 948/1973, all cause-of-death investigations, including statistical reporting and archiving of death certificates, must be properly collected and reported. [48]

Client Information Act (159/2007)

The development and implementation of electronic information management in social services and health care are based on the Finnish Act on the Electronic Processing of Client Information in Social Welfare and Health Care Services (159/2007, hereinafter referred to as the "Client Information Act") and the Finnish Act on Electronic Prescriptions (61/2007). Act on the Electronic Processing of Client Data in Social and Health Care guarantees effective security on usage of electronic health records. Provisions on passing on information contained in patient documents by means of the national information system services are laid down in the Act on the Electronic Processing of Client Data in Social and Health Care (159/2007). [49]

Statistics Act (280/2004)

The basis for the cause of death investigations is the present Act (1973/459). Furthermore, Regulation (EC No 1338/2008 of the European Parliament and of the Council of 16 December 2008 on Community statistics on public health and health and safety at work) regulates the data produced for Community cause of death statistics (Implementation Regulation No 328/2011). The compilation of statistics is regulated by the Statistics Act. Data collected in other contexts must be primarily exploited for statistics. The vast majority of data are drawn from diverse registers. Only such data that cannot be obtained from elsewhere are collected from data suppliers. State authorities have a statutory obligation to supply data from the information in their possession. Enterprises, municipal organizations and non-profit institutions are obliged to supply data on matters separately prescribed in law. [50] [51]

Personal Data Act (523/1999) and Act (556/1989) and Decree (774/1989) on Nationwide Personal Data Registers in Health Care

Health data, including the state of health, illness or disability of a person, along with the medical treatment, is considered as sensitive data under the Personal Data Act. The registration of patients in the health care system is regulated by several laws in Finland. In general these Acts state that confidential personal information can be delivered only if special conditions can be met. Also, the Act on the Status and Rights of Customers in Social Care (812/2000), and the Act on the Statistical Activity of the National Institute for Health and Welfare (409/2001) govern how personal health data must be handled. [52] [53]

Working Group for Discussing and Renewing Legislation and Costs due to Forensic Medicine in Finland

A working party on causes of death has been set up for the period of 11/2015 – 12/2017. Its aim is to simplify, clarify and update a piece of legislation which was approved more than 40 years ago. Its aim is also to restructure and restrict the expenses and reimbursements of the forensic medicine functions. [54]

Working Group for Discussing and Renewing Legislation due to Electronic Patient Records of Health and Social Welfare Customer Data in Finland

A working party on customer data of electronic records of health and social welfare has been set up for the period of 4/2015 – 5/2016. THL has been trying to contribute the renewal of legislation in respect of death certificates of forensic autopsies being considered as documents to be archived in KanTa repository.

Medicolegal examiners of THL, as administrative officers, do not by default have access right to patient information registry of KanTa. However, as authorized doctors they should have. [55]

Working Group for Discussing and Renewing Legislation due to Secondary Use of Customer and Patient Registries

A working party on secondary use of data registries has been set up for the period of 4/2015 – 5/2016. The ultimate goal is to find harmony and get an agreement on data reprocessing in research, business development, management and control in all sectors of our society ensuring true technology independence delivery. [20][56]

International Cooperation

Under the agenda of our project we tried to broaden our vision in an international arena. We would have been keen on hearing Estonia's approach on utilizing their X-road on data collection. Unfortunately, their death certificates are still done on paper. In Estonia X-road is used for downloading of personal data of the deceased from the Population Registry mainly. Fortunately, we had a chance to share experience with the Danish instead.

In 2007, Denmark was the first country in the world to introduce fully electronic reporting of death. [57]. Also Sweden, France and Portugal have developed electronic solutions of their own. In April 2016, we visited Copenhagen and Sundhedsdatastyrelsen which is the Danish health authority.

Danish Death Certificate

In 1875, registration of causes of death in Denmark was established by the National Board of Health and annual statistics of death have been published ever since. Until 1970, the national statistics were based upon punched cards with data collected from the death certificates. Since then the register has been fully computerized and includes individual data of all deaths occurring among all residents domiciled in Denmark. [58]

Since 2007, death certificates have been submitted by an electronic form to the National Board of Health. A medical doctor, either the deceased's own doctor or, if the deceased has died in hospital, a certificate will be issued by one of the doctors who had treated the patient. A medical doctor verifies the death and issues a death certificate indicating the underlying and contributory causes of death. He or she also classifies these causes in accordance to ICD-10, and fills in the coded data on the electronic death certificate. The register is updated without central validation of the classification, and relies entirely on the coding done by individual physicians. [58] IRIS is used for data validation. A number of checks are run against various data sources. It still leaves about 20 % of death certificates to be checked manually.

An inquiry is held when the death occurs in a public place, home, or when suspecting some foul play. Police reports are automatically made available to the Medico-Legal Institute. In Denmark the autopsy rate is below 10 %. An autopsy is performed in less than 20 % of deaths occurring in hospitals compared to 75 % in the 1970s, and is low even in cases of sudden unexpected death occurring outside hospitals. [58]

A Danish death certificate includes two pages. Page 1, i.e. the proof of death document, is for civil data that goes to legal processes, civil registration, family and church offices. Page 1 goes with the deceased. It can be compared to Finnish burial permit. The process flow is digital but the document is signed by pen. A signed copy is sent back to Sundhedsdatastyrelsen. Page 2 is for medical data that is used for statistics and refund claims. Medical examiners are liable for the process proceeding in an orderly manner having both Page 1 and 2 properly filled in and signed. A particular objective is to reduce a number of missing certificates that are not issued in the first place.

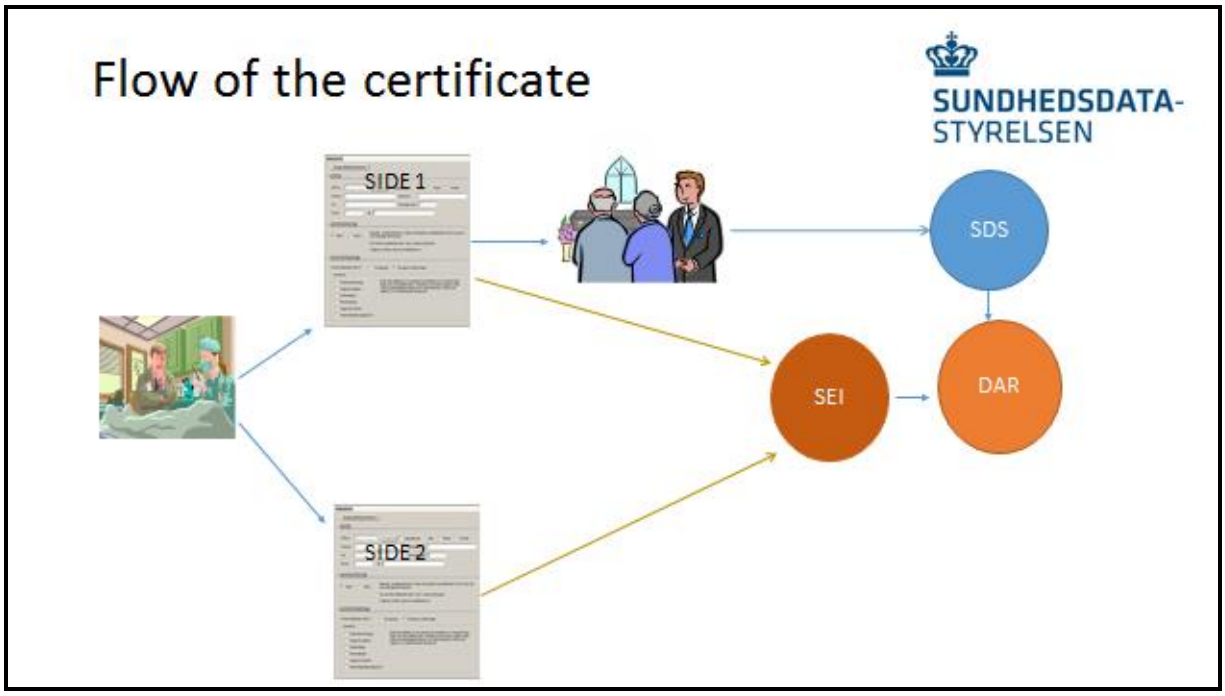


Figure 1. The Flow of eDeath Certificates in Denmark

Questions and Answers

We were prepared for our visit with a bunch of questions and came back home with some good answers.

Q Are all Danish death certificates issued electronically?
A Today 92 % of Pages 1 and 96% of Pages 2 are reported electronically.

Q Who are the issuers?
A Death certificates are issued by physicians.

Q Are you using the IRIS? If yes, what is it used for and how? Do you find it useful?
A There is a direct feed input to IRIS against which the data is validated. A use of IRIS results in increased data quality.

Q Who is the competent authority to produce statistics on causes of death in Denmark?
A These statistics are produced by Sundhedsdatastyrelsen.

Q Who declares a death?
A It is always a medical examiner, a physician, who declares a death – never police.

Q Where, when and by whom is a notification of death given?
A A death notification is given by a physician / medical doctor who declares the death. It is included in Page 1.

Q Where, when and by whom is a death certificate given?
A A death certificate is given by a medical examiner who declares a death or in case of an autopsy by the person performing it.
Q Where, when and by whom is a burial permit given?
A A burial permit is given by filling out the Page 1.

Q Who is eligible to obtain a death certificate original and copy?
A A medical examiner or hospital decides if a copy of both Pages can be sent to the next of kin or relatives.

Q For how long does all process from the moment of death to a complete death certificate take?
A It depends. No exact time frame can be given. Two days on average.

Q Is your process by any means governed or regulated by law?
A Yes. Sundhedsloven, BEK 320 27. marts 2007, VEJ 10101 19. december 2006, BEK 1046 20. oktober 2006 and VEJ 10130 1. december 2006.

Q Foreign deaths in your country and deaths of your citizens overseas – how are they handled?
A All foreigners are dealt in the same way as the Danish.

Similarities

There are many laws that govern the process like in Finland. A medical examiner only can declare a death. In both countries a medico-legal autopsy is ordered by the police.

Differences

In Denmark a time of death is not estimated but declared at the place of death. IRIS is widely used. ACME, automatic coding, results in increased data quality. Medical examiners handle ICD codes, and not diagnoses, as the codes form the national registry. Death certificates are not verified by any authority. Page 1 and Page 2 can be filled out by two different doctors depending on the case. The autopsy rate is a far higher in Finland than in Denmark. In Finland a forensic autopsy is performed in around 20 % of cases of all deaths. [59]

Lessons Learnt

Our Danish colleagues introduced a new web solution of theirs. In a case of death, it automatically sends a death datum message to a caring doctor triggering a death certificate process (see Figure 2). A web service will replace a current practice of emailing thus introducing a more secure way of bypassing data. In a web based service no extra inquiries for details of the death certificate provider need to be done as the caring doctor of the deceased is known by the state. Sundhedsdatastyrelsen queries the registry of certificate providers.

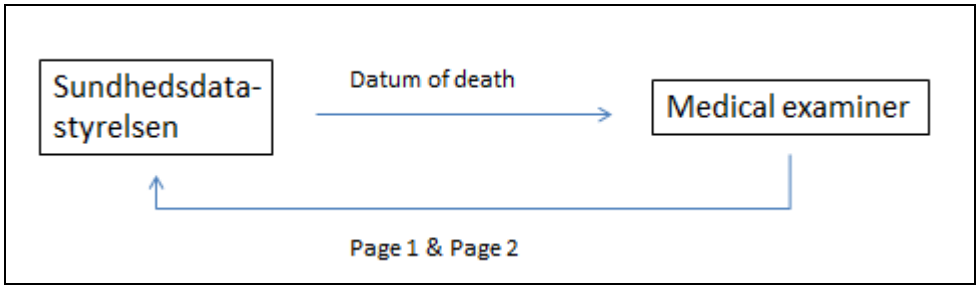


Figure 2. Process Flow of Death Certificates in Denmark

To simplify the death certificate inquiry process in Finland, a registry of medical examiners issuing death certificates would be needed. It would save us from extra inquiries of missing death certificates. A figure 2 below explains the process flow currently in Finland. It is explained in more detail in delivery report for Objective 1.

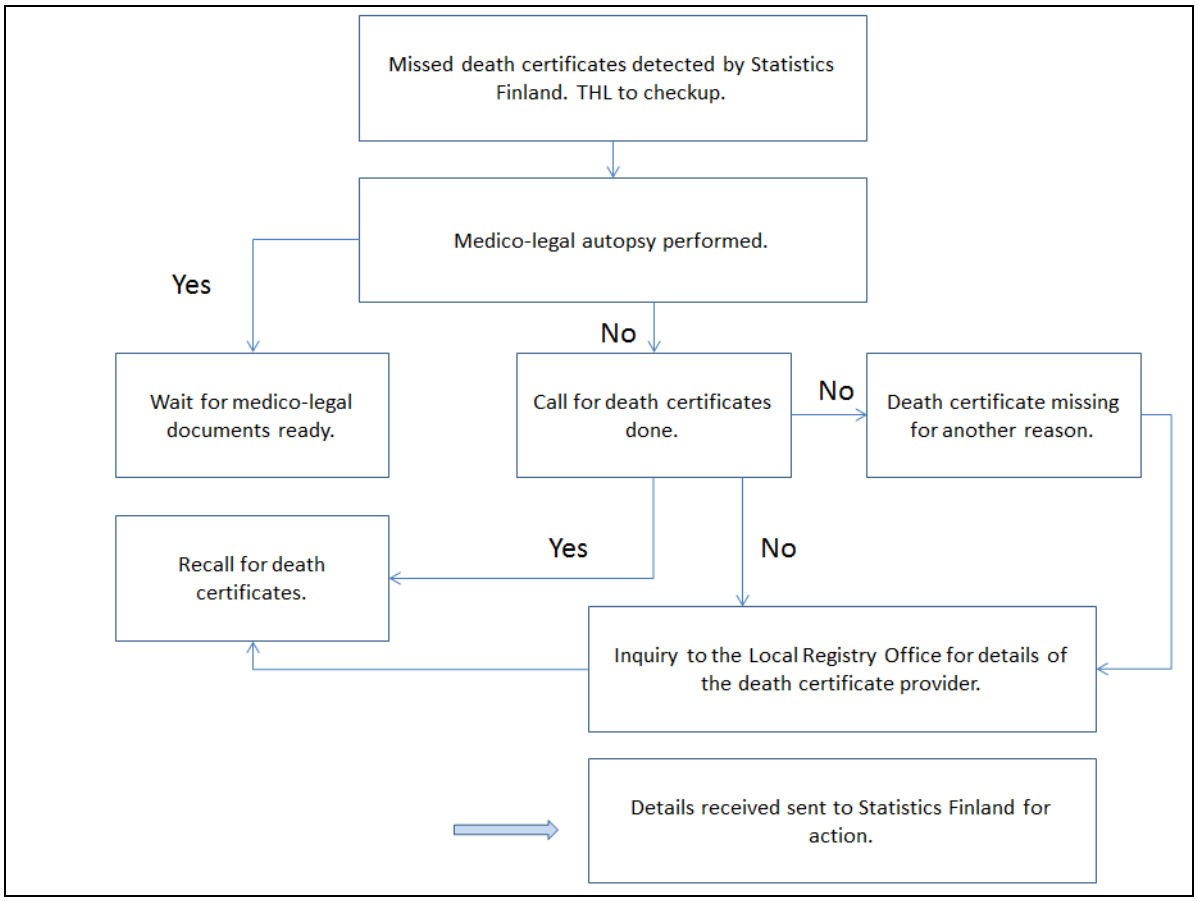


Figure 3. Process Flow of Death Certificate Inquiry in Finland

As a summary both countries can state that an electronic death certificate enables a faster update of data, increases data quality, speeds up the data flow and cooperation between national authorities.

Digitalizing Death Certification Process – A National Plan

The Commission has awarded a grant for the action entitled ”E-certification of causes of death”. In Finland, death certificates are issued by doctors. 80% of death certificates are issued for dead people who have been old or have been known to suffer from diseases. Those death certificates are issued without performing an autopsy. 20% of death certificates are issued after performing an autopsy. The Finnish law requires a medicolegal autopsy to be performed on certain occasions, e.g. after an accident or when the death has happened unexpectedly.

Forensic medicine experts of the National Institute for Health and Welfare (THL) inspect every death certificate issued in Finland. THL launched a new Forensic Medicine Information System on 1 January 2016. It means, that 20% of all death certificates issued in Finland are complete e-certificates. The remaining 80% of all death certificates issued afield are still printed out and sent to THL for an approval. After an approval all death certificates will be sent to Statistics Finland. Statistics Finland is the competent authority to produce statistics on causes of death and mortality rate evolution. Statistics Finland also holds the mandate of the archival authority and maintains the Finnish archive of death certificates. The archive contains death certificates of Finnish residents since 1936.

This project has had four objectives. Through a close assessment of the current national situation and patient record systems, and by piloting an HL7 CDA R2 document template of the Finnish death certificate we ended up presenting a national plan of how to digitalize all death certification process in Finland.

Objectives and Key Results

This report will serve as national plan and guideline for enabling a thoroughly electronic process for both delivery and reuse of death certificate data. Our vision is to play a key role in coordinating, steering and supervising death certificate data, upholding national regulations and delivering up-to-date statistical data for future eHealth development both in academic and business communities.

By introducing this plan, we aim at speeding up the death certification process, enhancing the overall quality, improving the information security and facilitating both archiving and statistics production of CoD data. By electronic data processing is referred to any copying, saving, transfer, approval, archiving or use of death certificate data without manual processes with lots of paper and people involvement. The proposed actions reflect regulations and technical solutions put forward in this report. Connection to KanTa interface is ignored due to legislative obstacles. For our part proposed actions are ready to be executed in close cooperation with many stakeholders involved.

Proposals

A national plan for the introduction of fully electronic death certificate countrywide includes nine proposals dependent on the other. All services, stakeholders and technical details are introduced either earlier in this document or in deliverables for Objectives 1 and 2.

There are two ways of issuing a death certificate. It can either be issued in the Forensic Medicine unit of THL or in a health care unit where a death has taken place or a deceased been taken care of during his/her lifetime. The Forensic Medicine Information System developed in parallel of the EDC project already produces fully compatible electronic death certificates for the use of THL, as piloted in Objective 3. We hereby direct the proposals to apply to death certificates issued outside the Forensic Medicine unit of THL.

The nine proposals are:

1. An accredited service for digital forms must be established.
2. A notification of death is sent to Population Register by the accredited service.
3. A CDA R2 compatible electronic death certificate is supplied by the accredited service.

4. The CDA structure of the forms is maintained in Code Server of THL.
5. Official officer registry of the issuing physicians must be established.
6. Guidance and up-to-date instructions for filling in an e-death certificate must be published and provided by THL.
7. A physician's duty is to provide an approved death certificate. If not first approved, a revised version must be provided. Steering function of THL supports the action.
8. An approved death certificate will be sent to Statistics Finland.
9. All approved death certificates will be archived in Statistics Finland.

A national plan for a countrywide electronic death certificate flow is illustrated in Figure 4. First, there must be an accredited service (1) established for digital forms of the death certification process. The service could be something similar to Kelain service, or be a whole new one for an easy access to content maintained by THL. The content includes structured digital forms of electronic death notification and death certificate. An accredited service lies on a server that can be accessed by patient information systems in use. Any other kinds of services are not allowed for the purpose of forwarding death notifications and death certificates. A service is provided by KAPA architecture interface.

A death notification is always done by a physician who declares a death. A death notification must be sent to Population Register immediately after the death declaration without any delays (2). The health care unit or the physician has to report the death to the Population Information System. Death certificate data are compared with data on the deceased obtained from the Population Information System. A death certificate is issued (3) by the physician responsible for cause of death investigation. The structure of both forms, death notification and death certificate, is maintained by Code Service of THL (4).

Contact information of death certificate authors must be collected (5) during the session to enable further contact in terms of death certificate verification controlled and supervised by THL. Information must be updated and checked on each session log on. This is something we could learn and copy from the Danish system introduced in Chapter "International Cooperation".

Steering function of THL obligates us to provide proper guidance, help and instructions (6) for certifying physicians. It must be absolutely clear when, by whom and how an electronic death certificate must be issued. Population Register is queried after the domiciled to control a death certificate has been issued. A death certificate author is obliged to reissue a certificate if needed (3, 7). It is his or her responsibility to have it compiled accordingly and sent to THL for approval. If the death certificate author is not caught (despite the register) to finish the certificate, it can be reissued by an authorized governor of a health district or a medico-legal officer of THL.

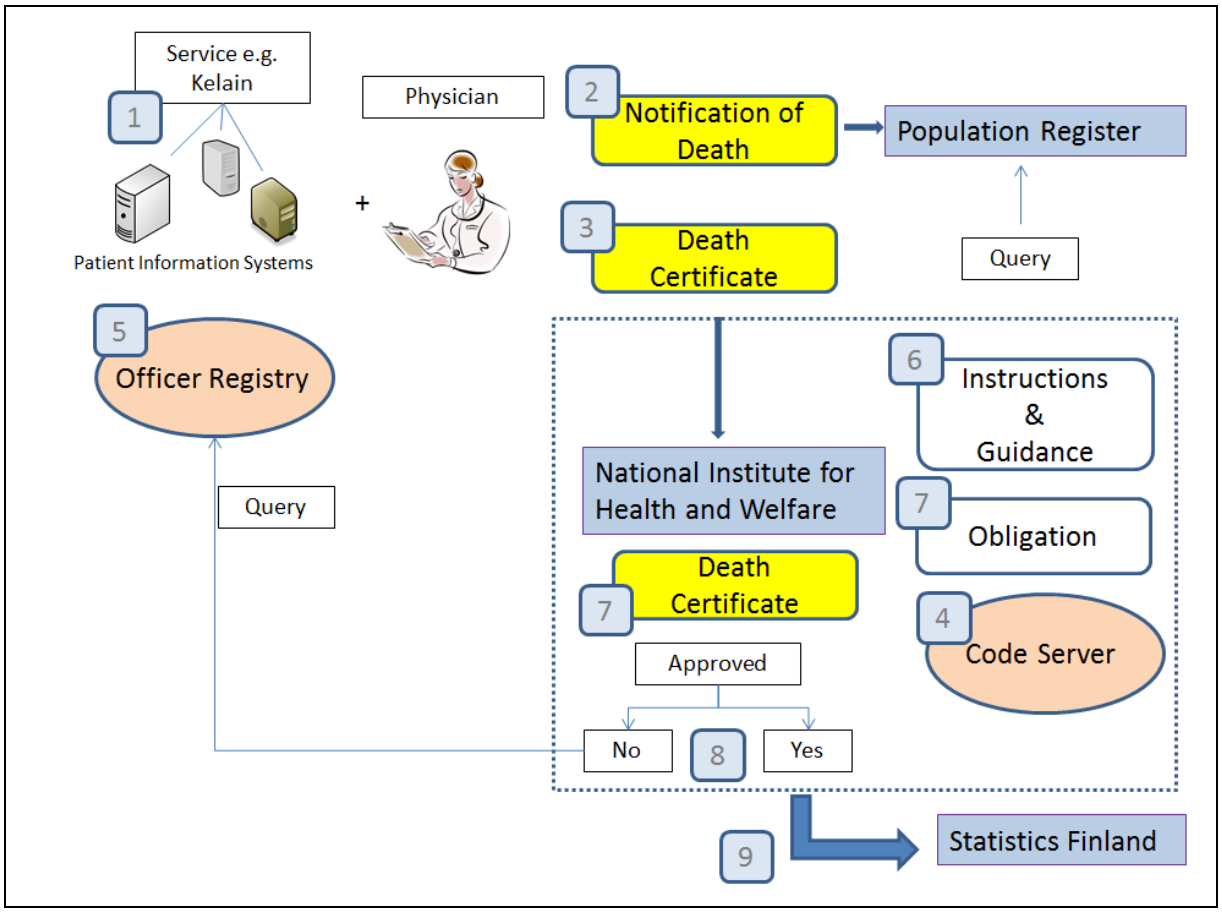


Figure 4. National Plan for Digitalizing Death Certification Process in Finland

All death certificates in Finland will be approved by THL. Death certificates approved and signed by THL will automatically be sent to Statistics Finland (8). There now is a direct connection between Statistics Finland and THL as described in Delivery Report for Objective 3. Interface provided by KAPA architecture might also be an option for digital transfers. If there is no body to be examined or autopsied, a medico-legal officer is responsible for all above mentioned actions to provide a death certificate. Statistics Finland maintains the Finnish archive of death certificates (9).

Enhancement Proposal

After a successful introduction and implementation of the national plan presented there is a need for a discussion of relocating the archive of death certificates. A National Institute for Health and Welfare already holds a mandate to digitally archive all data recorded in the Forensic Medicine Information System of THL.

According to THL's data policy we should strive for a single source and efficient use of our data. Consequently, we would like to arouse a question whether or not it is functional to transfer digital certificates further to Statistics Finland for archiving. What organization will own the cause of death data in future? Compiling agency for CoD statistics authority has been a matter for some debate during 2009 – 2011. As the debate was postponed to a later date until all certification process is digitalized, we will anticipate a decision of the matter in near future.

Proposal Governance

As a mandatary authority THL should enjoin a formal death certificate template. It is maintained on the Code Server and published as a service. THL will designate a transitional period before the new templates

come into force. Execution will be done by the Unit for the Operational Management of Health and Welfare Information (OPER).

Actions and observations relating to all planned processes and their interaction and decision-making among the actors involved whether undertaken by a Finnish Government or any other organization are listed below:

- A national order or provision needs to be given regarding the use of officially published CDA R2 structure of death certificate all over the country
- Ownership of the death certificate data registry and archive must be determined
- Proper instructions and guidance must be provided
- THL responsibility for steering and control of the change must be well defined and in place.

Forums of Collaboration and Communication

There is a need for cooperation to realize shared goals. Forms of working together and forums for spreading the word are essential for presenting the goal and ensuring effective execution:

- Collaboration forums of information system providers for information sharing
- Cooperation with Statistics Finland and Population Register Centre
- UNA project
- KAPA project
- Working groups for legislation renewals.

Proposal Costs and Benefits

The benefits of a national plan presented and any related actions are summed, and costs associated with it are subtracted. Adopting and implementing the plan will seamlessly lead to cost-based thinking resulting in:

- Death certificate process timeliness
- Death certificate process efficiency
- Death certificate delivery on time
- Quality improvements due to proper guidance and instructions
- Real-time statistics of CoD
- Real-time follow-up of epidemics and predictable diseases
- Faster performance of steering and guidance of THL
- Inclusive reporting
- Comprehensive data processing and reuse
- Input to national policy making in bed with legislators.

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