PUBLICATIONS OF
THE UNIVERSITY OF EASTERN FINLAND

Dissertations in Health Sciences

ILKKA OJANSUU

Mortality among forensic psychiatric patients in Finland

MORTALITY AMONG FORENSIC PSYCHIATRIC PATIENTS IN FINLAND

Ilkka Ojansuu

MORTALITY AMONG FORENSIC PSYCHIATRIC PATIENTS IN FINLAND

To be presented by permission of the
Faculty of Health Sciences, University of Eastern Finland
for public examination in MD100 Auditorium, Kuopio
on February 5th, 2021, at 12 o'clock noon

Publications of the University of Eastern Finland
Dissertations in Health Sciences
No 603

Department of Forensic Psychiatry
Faculty of Health Sciences
University of Eastern Finland
Kuopio
2020

Distributor:
University of Eastern Finland
Kuopio Campus Library
P.O.Box 1627
FI-70211 Kuopio, Finland
www.uef.fi/kirjasto

Grano Oy, 2020

ISBN: 978-952-61-3680-6 (print/nid.)
ISBN: 978-952-61-3681-3 (PDF)
ISSNL: 1798-5706
ISSN: 1798-5706
ISSN: 1798-5714 (PDF)

Author's address: Department of Forensic Psychiatry
University of Eastern Finland
KUOPIO
FINLAND

Doctoral programme: Clinical Research

Supervisors: Professor Jari Tiihonen, M.D., Ph.D.
Department of Forensic Psychiatry
University of Eastern Finland
KUOPIO
FINLAND

Assistant Professor Hanna Putkonen, M.D., Ph.D.
Department of Psychiatry
University of Helsinki
HELSINKI
FINLAND

Reviewers: Professor Pirkko Riipinen, M.D., Ph.D.
Department of Psychiatry
University of Oulu
OULU
FINLAND

Docent Taina Laajasalo, Ph.D.
Department of Forensic Psychology
University of Helsinki
HELSINKI
FINLAND

Opponent: Professor Jyrki Korkeila, M.D., Ph.D.
Department of Psychiatry
University of Turku
TURKU
FINLAND

Ojansuu, Ilkka
Mortality among forensic psychiatric patients in Finland
Kuopio: University of Eastern Finland
Publications of the University of Eastern Finland
Dissertations in Health Sciences 603. 2020, 69 p.
ISBN: 978-952-61-3680-6 (print)
ISSNL: 1798-5706
ISSN: 1798-5706
ISBN: 978-952-61-3681-3 (PDF)
ISSN: 1798-5714 (PDF)

ABSTRACT

The purpose of the present study is to analyse mortality among Finnish forensic psychiatric patients who, after having committed a crime, were diagnosed with a psychotic disorder during their forensic psychiatric examinations and who had been committed to involuntary psychiatric treatment instead of being sentenced to prison. The aim of this dissertation is to examine the overall mortality of Finnish forensic psychiatric patients, mortality by the cause of death, the effect of substance use disorder on mortality and the effect on mortality of the patient's age at the time of commitment to psychiatric treatment. The study population consists of the patients committed to compulsory forensic psychiatric hospital treatment in Finland from 1980 to 2009.

The study found that the mortality among forensic psychiatric patients was up to threefold higher than that of the general population. The majority of the deaths were natural but the most significant difference compared to the general population was the sevenfold elevated suicide risk. Over half of the suicides occurred during forensic psychiatric hospital treatment which reveals an obvious treatment failure in these cases. Forensic psychiatric patients who were younger than middle-aged at the start of treatment were found to have a higher standardised mortality ratio than middle-aged or older patients during follow-up. Mortality due to natural and unnatural causes among Finnish forensic psychiatric patients was found to be similar to the mortality of Finnish schizophrenia patients in general.

The majority of Finnish forensic psychiatric patients had clear evidence of a substance use disorder (SUD) in addition to a psychotic disorder during their forensic psychiatric examination. However, the study also found that 30% of the patients with clear diagnostic evidence of an SUD in the examination were left without an appropriate diagnosis. This indicates problems with identifying and diagnosing substance use disorders which may have led to deficiencies in providing proper treatment for such patients. Age-adjusted mortality was found to be considerably higher in patients with an SUD and the higher mortality in men with an SUD was clearly associated with unnatural deaths.

Comparing the results of this study with earlier international studies on the mortality of forensic psychiatric patients is problematic as these other data also included other

patients and not just psychotic disorder patients. The mortality of Finnish forensic psychiatric patients was found to be similar, albeit in part significantly lower than that observed in these studies in other countries. The greatest difference was with regard to the number of suicides which was found to be manifold in the other data compared to the mortality of Finnish forensic psychiatric patients. The study detected clearly longer treatment periods for Finnish forensic psychiatric patients compared to those reported in other countries, and this was identified as a factor that could protect from mortality.

Despite investments in the treatment of Finnish forensic psychiatric patients, a clear excess mortality due to both natural and unnatural causes was observed in this patient cohort and SUDs are one key factor behind this excess mortality. In order to reduce mortality, it is important to identify patients with a higher risk of suicide both during forensic psychiatric treatment and outpatient care and to draw attention to the treatment of the possible SUD in addition to the psychotic disorder. The appropriate treatment of somatic diseases must be arranged not only during forensic psychiatric hospital treatment but also after the patient has transferred to outpatient care.

National Library of Medicine Classification: WM 203, WA 900, W 740
Medical Subject Headings: Psychotic Disorders; Schizophrenia, Substance-Related Disorders; Mortality; Cause of Death; Suicide; Homicide; Hospitalization; Involuntary Treatment, Psychiatric; Forensic Psychiatry; Retrospective Studies; Follow-Up Studies

Ojansuu, Ilkka
Oikeuspsykiatristen potilaiden kuolleisuus Suomessa
Kuopio: Itä-Suomen yliopisto
Publications of the University of Eastern Finland
Dissertations in Health Sciences 603. 2020, 69 s.
ISBN: 978-952-61-3680-6 (nid.)
ISSNL: 1798-5706
ISSN: 1798-5706
ISBN: 978-952-61-3681-3 (PDF)
ISSN: 1798-5714 (PDF)

TIIVISTELMÄ

Tutkimus käsittelee kuolleisuutta suomalaisilla oikeuspsykiatrisilla potilailla, joilla on rikokseen syyllistymisen jälkeen todettu mielentilatutkimuksessa psykoosisairaus, ja jotka on vankeuden sijaan määrätty tahdostaan riippumattomaan oikeuspsykiatriseen hoitoon. Tämän väitöskirjatyön tavoitteena oli selvittää suomalaisten oikeuspsykiatristen potilaiden kokonaiskuolleisuus, kuolleisuus eri kuolemanluokissa, päihdehäiriöiden vaikutus kuolleisuuteen ja potilaiden hoitoon määräämisajankohtana olleen iän vaikutus kuolleisuuteen. Tutkimusaineistona olivat Suomessa vuosina 1980–2009 hoitoon määrätyt oikeuspsykiatriset potilaat.

Tutkimuksessa todettiin oikeuspsykiatristen potilaiden kuolleisuuden olevan kolminkertainen yleisväestöön nähden. Suurin osa kuolemista johtui luonnollisista kuolinsyistä, mutta merkittävin ero yleisväestöön nähden oli seitsenkertainen itsemurhakuolleisuus. Yli puolet itsemurhista oli tehty oikeuspsykiatrisen sairaalahoidon aikana, mikä oli osoitus selkeästä hoidollisesta epäonnistumisesta näiden potilaiden kohdalla. Oikeuspsykiatrisilla potilailla, jotka olivat hoidon alkaessa alle keski-ikäisiä, todettiin seurannassa suurempi ikävakioitu kuolleisuus yleisväestöön nähden kuin keski-ikäisinä tai tätä vanhempina hoitoon määrätyillä. Suomalaisten oikeuspsykiatristen potilaiden kuolleisuuden luonnollisiin ja ei-luonnollisiin kuolemansyihin todettiin olevan vastaavaa tasoa kuin suomalaisilla skitsofreniapotilailla yleisesti on todettu.

Valtaosalla suomalaisista oikeuspsykiatrisista potilaista oli ollut mielentilatutkimuksessa todettavissa psykoosisairauden rinnalla päihdehäiriö. Tutkimuksessa kuitenkin todettiin, että 30 %:lla potilaista, joilla oli mielentilatutkimuksessa kuvattu selkeä päihdehäiriö, oli jätetty asianmukainen diagnoosi asettamatta. Tämä viittaa puutteeseen päihdehäiriöiden tunnistamisessa sekä diagnosoinnissa, mikä on osaltaan voinut johtaa myös puutteisiin päihdehäiriöiden hoitamisessa. Ikävakioitu kuolleisuus todettiin selkeästi suuremmaksi päihdehäiriön omanneilla potilailla, ja päihdehäiriön omanneiden miesten korkeampi kuolleisuus assosioitui selkeästi epäluonnollisiin kuolemiin.

Tutkimuksen tulosten vertaamisessa aiempiin kansainvälisiin oikeuspsykiatristen potilaiden kuolleisuutta käsitelleisiin tutkimuksiin on ongelmallista, koska nämä

potilasaineistot ovat pitäneet sisällään myös muita kuin psykoosisairaita potilaita. Suomalaisten oikeuspsykiatristen potilaiden kuolleisuuden todettiin olevan samansuuntainen, joskin osittain huomattavasti alempi kuin näissä muiden maiden tutkimuksissa on todettu. Suurin ero todettiin itsemurhakuolleisuuden osalta, minkä todettiin muissa aineistoissa olleen moninkertainen suomalaisten oikeuspsykiatristen potilaiden kuolleisuuteen nähden. Tutkimuksessa todettu suomalaisten oikeuspsykiatristen potilaiden selkeästi pidempi hoitoaika muissa maissa julkaistuihin hoitoaikoihin nähden todettiin mahdollisesti kuolleisuudelta suojaavaksi tekijäksi.

Suomalaisten oikeuspsykiatristen potilaiden hoitoon käytetyistä panostuksista huolimatta on tässä potilasryhmässä todettavissa selkeä ylikuolleisuus sekä luonnollisten että ei-luonnollisten kuolemansyiden osalta, ja päihdehäiriöt ovat yksi keskeinen tekijä ylikuolleisuuden taustalla. Kuolleisuuden alentamiseksi on sekä oikeuspsykiatrisen hoidon aikana että avohoitoon siirryttäessä tärkeätä tunnistaa kohonneessa itsemurhariskissä olevat potilaat ja kiinnittää huomiota psykoosisairauden rinnalla mahdollisesti ilmenevän päihdehäiriön hoitoon. Somaattisten sairauksien asianmukaisen hoidon järjestäminen tulee toteutua paitsi oikeuspsykiatrisen sairaalahoidon aikana, myös potilaan siirryttyä avohoitoon.

National Library of Medicine Classification: WM 203, WA 900, W 740
Medical Subject Headings: Psychotic Disorders; Schizophrenia, Substance-Related Disorders; Mortality; Cause of Death; Suicide; Homicide; Hospitalization; Involuntary Treatment, Psychiatric; Forensic Psychiatry; Retrospective Studies; Follow-Up Studies

Pater, ignosce illis, non enim sciunt quod faciunt.
Iesvs Nazarenvs

ACKNOWLEDGEMENTS

This dissertation was done at the Department of Forensic Psychiatry, Niuvanniemi Hospital at the University of Eastern Finland, which also provided financial assistance for this work. I would like to thank the Department of Forensic Psychiatry and Niuvanniemi Hospital for making my research possible.

I am extremely grateful to my primary supervisor, Professor Jari Tiihonen, for his guidance and support which inspired me to do research and made this dissertation possible. A heartfelt thank you also to my secondary supervisor, Assistant Professor Hanna Putkonen, for her encouragement and advice on composing scientific articles. I am also very thankful to my co-author, Markku Lähteenvuo, for his help and support in my research in general and for our fruitful cooperation with regard to the third publication in particular. I would like to thank the pre-examiners of my dissertation, Professor Pirkko Riipinen and Docent Taina Laajasalo, for their constructive criticism and comments that allowed me to improve my work.

A warm thank you to Jace Callaway and Ewen MacDonald for revising my articles. Many thanks to Hannu Kautiainen for his work and assistance with the statistical analyses. A heartfelt thank you also to Tarja Koskela and Aija Räsänen for their secretarial work which helped me with many practical arrangements, from collecting the studied data to finalising the work for printing. I could not have done it without your help. Thank you to all my colleagues and friends for their support and encouragement in my research work.

I would like to thank my family for being there for me and supporting me. This gave me the strength to carry out my research alongside everything else. A special thanks to my parents who have been there to motivate and encourage me throughout my life. Thanks to all my dogs who brightened my days and took me for much-needed walks away from my writing. Your companionship and sincere love has been a great source of strength for me.

Finally, I would like to thank my dear wife, Satu, for supporting and encouraging me. Thank you for all the times we have shared. With you, everything is so much more beautiful.

Kuopio, October 2020

Ilkka Ojansuu

LIST OF ORIGINAL PUBLICATIONS

This dissertation is based on the following original publications:

I Ojansuu I, Putkonen H, Tiihonen J. Mortality among forensic psychiatric patients in Finland. Nord J Psychiatry. Jan;69(1):25-7, 2015.

II Ojansuu I, Putkonen H, Tiihonen J. Cause-specific mortality in Finnish forensic psychiatric patients. Nord J Psychiatry. Jul;72(5):374-379, 2018.

III Ojansuu I, Putkonen H, Lähteenvuo M, Tiihonen J. Substance abuse and excessive mortality among forensic psychiatric patients: A Finnish nationwide cohort study. Front Psychiatry. Sep 13;10:678, 2019

The publications were adapted with the permission of the copyright owners. Also some unpublished data are presented.

CONTENTS

ABSTRACT **7**

TIIVISTELMÄ **9**

ACKNOWLEDGEMENTS **13**

1 INTRODUCTION **21**

2 REVIEW OF THE LITERATURE **23**
2.1 Commitment to forensic psychiatric treatment in Finland 23
2.2 Forensic psychiatric treatment in Finland 25
2.3 Mortality in the general population in Finland 26
2.4 Comparing mortality 26
2.5 Mortality in schizophrenia spectrum disorders 27
2.5.1 Suicide mortality in schizophrenia spectrum disorders 28
2.5.2 Accident mortality in schizophrenia spectrum disorders 29
2.5.3 Homicide mortality in schizophrenia spectrum disorders 30
2.5.4 Natural causes of death associated with schizophrenia spectrum disorders 30
2.5.5 Mortality in schizophrenia spectrum disorders with comorbid SUD 33
2.6 Mortality in forensic psychiatric patients 34

3 AIMS OF THE STUDY **39**

4 SUBJECTS AND METHODS **41**
4.1 Study I: Mortality among forensic psychiatric patients in Finland 41
4.2 Study II: Cause-specific mortality in Finnish forensic psychiatric patients 41
4.3 Study III: Substance abuse and excessive mortality among forensic psychiatric patients in Finland 42

5 RESULTS **45**
5.1 Study I 45
5.2 Study II 45
5.3 Study III 46
5.4 Unpublished results 48

6 DISCUSSION **51**
6.1 All-cause mortality in forensic psychiatric patients 51
6.2 Mortality between the sexes in forensic psychiatric patients 52
6.3 Disease-related mortality in forensic psychiatric patients 52
6.4 Suicide mortality in forensic psychiatric patients 53
6.5 Accident and homicide mortality in forensic psychiatric patients 55
6.6 Mortality in forensic psychiatric patients with comorbid SUD 56
6.7 Statistical discussion 57
6.8 Future directions 57

7 LIMITATIONS **59**

8 CONCLUSIONS **61**

REFERENCES **63**

ABBREVIATIONS

COPD Chronic obstructive pulmonary disease

CDR Crude death rate

DSM Diagnostic and Statistical Manual of Mental Disorders

EU European Union

FDA US Food and Drug Administration

ICD International Classification of Diseases

SMR Standardised mortality ratio

SUD Substance use disorder

THL Finnish Institute for Health and Welfare

WHO World Health Organization

1 INTRODUCTION

Excess mortality associated with psychotic disorders in comparison to mortality in the general population has been known for decades (Harris et al., 1998). The mortality of schizophrenia patients has been shown to be elevated in connection with almost all somatic diseases, and significant excess mortality of schizophrenia patients from unnatural causes, such as suicide, accidents and homicide, has also been shown (Brown 1997; Saha et al., 2007; Laursen et al., 2013). Moreover, substance use disorders (SUDs) have been shown to be prevalent in psychotic disorders, and several studies show that they increase the mortality of psychiatric patients (Hunt et al., 2018; Heiberg et al., 2018; Hjorthøj et al., 2015).

Finnish forensic psychiatric patients are affected by both psychotic disorders and criminal behaviour which are both associated with higher risk of death (Walker et al., 2015; Zlodre et al., 2012). The possible effects of criminal background and forensic psychiatric treatment on the mortality of Finnish forensic psychiatric patients in comparison to other psychiatric patients or the general population has not been studied before.

Studies conducted in other countries show that the mortality of forensic psychiatric patients is, on average, higher than that of schizophrenia patients in general (Jones et al., 2011; Clarke et al., 2011; Tabita et al., 2012; Takeda et al., 2019). Mortality due to suicide is many times higher compared to that of schizophrenia patients and up to tens of times higher compared to that of the general population. Due to differences in legal systems, the studies conducted in other countries were conducted using research material that also included patients with other mental disorders in addition to patients with psychotic disorders. As a consequence, the results of these studies do not reflect the situation of Finnish forensic psychiatric patients entirely accurately.

Mortality is regarded the most robust outcome measure of illnesses and, therefore, the standard for measuring clinical performance (Brown et al., 2010). It is also an important indicator in psychiatric care where one of the ways practices and services are assessed is to see how well they reduce mortality. The Finnish system of recording causes of death, which has been found to be reliable and extensive, provides a solid foundation for studying mortality in Finland (Lahti et al., 2001).

The present study reviews the overall mortality of Finnish forensic psychiatric patients, deaths by the cause of death, the effect of the patient's age at the time of commitment to psychiatric treatment and the effect of substance use disorder on mortality. The aim of the study is to provide more information on mortality in Finnish forensic psychiatric patients which is necessary for developing the care of forensic psychiatric patients with psychotic disorders and minimising excessive mortality among forensic psychiatric patients both in Finland and in other countries.

2 REVIEW OF THE LITERATURE

2.1 COMMITMENT TO FORENSIC PSYCHIATRIC TREATMENT IN FINLAND

In Finland, a forensic psychiatric patient means a person who has committed a crime and, instead of being sentenced to prison, has been committed to involuntary forensic psychiatric treatment by the Finnish Institute for Health and Welfare (THL).

The minimum age of criminal responsibility in Finland is 15 (Criminal Code of Finland, Chapter 3, Section 4). The court may order that a person over the minimum age be remanded for a forensic psychiatric examination either with the consent of that person or without consent when the person is charged with an offence for which the maximum sentence is imprisonment for more than one year (Finnish Code of Judicial Procedure, Chapter 17, Section 37). Majority of the persons ordered to a forensic psychiatric examination have committed a homicide or another violent crime (THL online service).

The court order will be forwarded to THL, which will decide where the examination will be carried out (Finnish Mental Health Act, Chapter 3, Section 16). In recent years, the majority of such forensic psychiatric examinations have been carried out at the state-run Niuvaniemi psychiatric hospital. In 2019, over half of the examinations carried out took place at Niuvaniemi Hospital. The second most common location was another state-run psychiatric hospital, Vanha Vaasa Hospital, where around one quarter of the examinations were carried out. Examinations have also been carried out at the Turku and Vantaa units of the Psychiatric Prison Hospital and at the psychiatric units of the Helsinki, Tampere and Turku university hospitals. If the person has previously been treated for a mental illness or has already undergone a forensic psychiatric examination, THL may, instead of ordering an actual examination, submit a statement in court based on written documentation only. Within the past five years, around 5% of statements produced by THL have been based on written documentation (THL online service).

A forensic psychiatric examination can last up to two months but, if there are reasonable grounds for so doing, THL may extend the period of examination by a maximum of two months (Finnish Mental Health Act, Chapter 3, Section 16). During a forensic psychiatric examination, extensive information on the person's health and behaviour is gathered from various social and healthcare units, schools, workplaces, family, prison administration and court documents. The person's physical health is also examined. Psychiatric and psychological interviews make up a significant part of the overall examination. A key element in the examination is the evaluation of the person's possible psychotic symptoms as well as an evaluation of a possible connection between the symptoms and the person's behaviour and the crime in relation to which the examination is being carried out.

Any psychiatric diagnosis is given by the doctor in charge of the examination, and the diagnosis is based on observations made during the examination and the clinical conclusions drawn from them. In Finland, diagnoses are based on the International Classification of Diseases (ICD) diagnostic classification standard. The ICD standard

currently used is version 10, which was verified by the World Health Organization (WHO) in 1989. The previous version, version 9, had been in use from 1975.

The primary function of the forensic psychiatric examination is to form an opinion on the person's criminal responsibility in relation to the crime for which they were ordered to participate in the examination. Criminal responsibility is divided into three categories: criminal responsibility, diminished responsibility, and criminal irresponsibility. In 2019, THL assessed that 45% of the examined persons had criminal responsibility, 10% had diminished responsibility and 45% had criminal irresponsibility (THL online service).

When deciding on criminal responsibility, it is essential to assess whether the person had the ability to understand the true nature and consequences of their actions and whether they were able to control their behaviour in a situation when they had to make a choice. The Criminal Code of Finland states that a person is not criminally responsible if, at the time of the act and due to mental illness, severe mental deficiency or a serious mental disturbance or a serious disturbance of consciousness, they are not able to understand the factual nature or unlawfulness of their act or if their ability to control their behaviour is decisively weakened due to such a reason. If a person's ability to understand or control their behaviour is not crucially albeit significantly weakened, the person is regarded as having diminished responsibility, which may mitigate their criminal responsibility (Criminal Code of Finland, Chapter 3, Section 4, Chapter 6, Section 8). If the person's perception of reality is diminished as a result of their own action, such as intoxication, criminal responsibility is only regarded as diminished in exceptional cases.

A secondary function of a forensic psychiatric examination is to decide if the person is in need of involuntary psychiatric treatment or involuntary treatment referred to in the Finnish Act on Special Care for the Mentally Handicapped. A person can be ordered to undergo involuntary treatment in a psychiatric hospital against their will only if the person is diagnosed as mentally ill (Finnish Mental Health Act, Chapter 2, Section 8). A mental illness means a serious mental health disorder where the person suffers from a distorted perception of reality that can be considered as psychosis. A minor can be committed to treatment in case of a serious mental health disorder that does not have to be categorised as psychosis.

Forensic psychiatric examination statements are sent to THL by the unit that carried out the examination, and the Board for Forensic Psychiatric Affairs under THL reviews them. Based on the statement, the Board for Forensic Psychiatric Affairs presents its opinion on the person's criminal responsibility to the court and the Board for Forensic Psychiatric Affairs under THL makes its decision on initiating involuntary psychiatric treatment.

The court reviews the assessment by THL and makes a decision on the person's criminal responsibility status. A forensic psychiatric examination statement is not legally binding, so the court may arrive at a decision that differs from the statement and the assessment by THL.

2.2 FORENSIC PSYCHIATRIC TREATMENT IN FINLAND

If a person is deemed in need of involuntary treatment based on a decision by the THL Board for Forensic Psychiatric Affairs, the treatment will be initiated at a state-run psychiatric hospital or another psychiatric hospital assigned by THL after a forensic psychiatric examination (Finnish Mental Health Act, Chapter 4, Section 22).

The involuntary treatment of forensic psychiatric patients is primarily organised under the same principles and conditions as the involuntary treatment of any other psychiatric patients pursuant to the Finnish Mental Health Act. The main difference is the continuous assessment of treatment needs, which is carried out with a different level of frequency and following different practices.

The treatment needs of forensic psychiatric patients are assessed at least every six months, at which point the treating physician decides, based on observations prior to making the decision, whether or not the conditions for involuntary treatment are still being met and whether treatment should be continued or discontinued regardless of the patient's will (Finnish Mental Health Act, Chapter 3, Section 17). Before the decision is made, a second opinion by an independent physician may be requested by the patient. The head physician of the hospital makes a decision to continue or discontinue treatment based on his or her own assessment, a statement by the treating physician and a possible second opinion by an independent physician. If the head physician decides that treatment should be continued, the decision has to be affirmed by the administrative court.

If it is decided that the treatment will be discontinued, the patient will be informed and the decision has to be immediately affirmed by THL. THL will either affirm the decision to discontinue the involuntary treatment or, if it views that conditions for involuntary treatment still exist, refer the patient for treatment again.

If the hospital views that conditions for involuntary treatment still exist, the patient will be informed immediately and the decision has to be affirmed by the administrative court. If the administrative court does not affirm the decision but views that conditions for involuntary treatment no longer exist, the decision has to be affirmed by THL. THL will either affirm the decision to end the treatment or, where conditions for involuntary treatment still exist, refer the patient for treatment.

Unlike with other psychiatric patients, it is possible to implement a supervision period in the treatment of forensic psychiatric patients at the decision of THL. This means that a patient is given an opportunity to live outside the hospital while the involuntary treatment referral is still in force (Finnish Mental Health Act, Chapter 3, Section 18). Supervision during the supervision period is the responsibility of the local psychiatric unit which has been assigned the role by the relevant hospital district. The supervision period may be as long as the duration of the involuntary treatment. While the involuntary treatment referral is in force, the supervision period may be suspended if the patient's situation calls for this and the patient will be hospitalised.

2.3 MORTALITY IN THE GENERAL POPULATION IN FINLAND

When a person permanently residing in Finland dies, the relevant healthcare unit, physician or, in exceptional cases, the police must report the death into the Finnish Population Information System. The Digital and Population Data Services Agency forwards the data to Statistics Finland, which keeps official statistics on the number of deaths and the causes of death in Finland. The work of Statistics Finland is governed by a general act on the national statistical service (Statistics Act 280/2004) which includes provisions on the various stages of creating statistics. The Statistics Act requires statistics to be as reliable as possible and to provide an accurate reflection of society. Statistics are formed out of a large number of individual observations, and these observations must be arranged so that conclusions can be drawn. The data are arranged into classes in such a way that reflects the phenomenon in a logical manner. The terminology used for classification is carefully defined, and statistical standard classifications are almost without exception based on international recommendations or agreements. This ensures that statistical information is comparable. (Statistics Finland, online service).

Statistics from 2018 show that the most common causes of death in Finland were diseases of the circulatory system, which made up around 35% of deaths, while ischaemic heart diseases alone caused around 25% of deaths (Official Statistics Finland, Causes of death in 2018). After diseases of the circulatory system, the most common cause of death was different types of cancer, which made up around 24% of deaths. The next most common disease resulting in death was dementia, which caused around 19% of deaths. In 2018, two out of three deseaced persons had turned 75, and more than one third had turned 85. The average age at death was 85 years for women and 77 years for men.

In 2018, four per cent of all deaths were accidental. Accidental alcohol poisonings were included in alcohol-related deaths. The number of fatalities from accidents has decreased significantly during the past ten years but has remained at a fairly steady level in recent years.

The share of alcohol-related causes, including accidental alcohol poisonings, in all causes of death was only three per cent and has decreased by over 10% over the past five years. While the total number of alcohol-related deaths has decreased, the share thereof in both women aged 65 or over and men aged 75 or over has grown.

The number of suicides has come down significantly from the peak year of 1990. In recent years, suicide mortality has decreased so that it now makes up only around 1% of all deaths. Suicide mortality mostly affected men as three out of four of the persons who committed suicide were men.

2.4 COMPARING MORTALITY

Mortality means the number of deaths in a given population during a given time period. The simplest way to illustrate mortality is the crude death rate (CDR), which is the number of deaths per 1000 or 100000 person-years.

However, simply reporting the number of deaths is rarely useful when the aim is to compare the number of deaths between different groups of people as the composition of

different groups may differ greatly and CDR as a value does not take into account age distribution in the population.

The standardisation of different factors is necessary when mortality is compared between different populations, and age and gender are the most commonly used standardised values. The standardised mortality ratio (SMR) indicates the number of deaths recorded in the study population in relation to how many deaths would have been expected in the general population of the same age based on mortality data. The information needed to determine the SMR includes the number of deaths recorded in the study population, the number of people in the study population per age group and, in the case of the general population, information on mortality in the corresponding age groups.

The SMR indicates as a figure the extent to which mortality in the population studied has increased or decreased in relation to the general population. If the SMR is 1.0, the number of recorded deaths is the same as in the general population, i.e. no difference in mortality was detected in the study population compared to the general population. If the figure is over 1.0, the number of deaths detected in the study population is higher than in the general population, while a figure below 1.0 indicates that there are fewer deaths than in the general population (Naing, 2000).

2.5 MORTALITY IN SCHIZOPHRENIA SPECTRUM DISORDERS

Almost all psychiatric disorders are associated with an elevated risk of higher mortality (Harris et al., 1998). When reviewing mortality associated with psychiatric disorders, the risk of natural death has been found to be particularly high in relation to SUDs, eating disorders and organic mental disorders. The risk of unnatural deaths has been found to be particularly high in relation to schizophrenia and severe depression. Psychiatric disorders are estimated to be a very significant cause of death globally (Walker et al., 2015).

Psychiatric disorders are particularly associated with unnatural deaths as the psychiatric symptoms can cause self-destructive or risky behaviour. However, psychiatric disorders are also a major contributor in natural deaths which is just as important to consider when examining the elevated mortality associated with psychiatric disorders.

Excess mortality associated with schizophrenia has been known for decades (Harris et al., 1998). Meta-analyses conducted based on various studies showed an all-cause SMR of 2.5 for psychosis and schizophrenia patients (Walker et al., 2015; Saha et al., 2007). The SMR for natural deaths was 2.4 and 7.5 for unnatural deaths (Saha et al., 2007). A Finnish nationwide study covering 30 years did not observe any significant change in the all-cause mortality of schizophrenia patients: in 1984, the all-cause SMR was 2.6, while in 2014 it was 2.7 (Tanskanen et al., 2018). The life expectancy of persons with schizophrenia has improved over the decades. However, as the life expectancy of the general population has also improved, schizophrenia patients were only shown in 2014 to have reached the life expectancy which the general population already had in 1981.

Different studies have had differing results concerning mortality in male and female schizophrenia patients. Several studies show all-cause mortality in men with

schizophrenic disorders to be higher than in women (Joukamaa et al., 2001; Chang et al., 2010; Brown et al., 2010). Mortality in male patients has been found to be higher than in women especially with regard to unnatural deaths, which is the reason why the all-cause mortality rate is also higher for men (Brown, 1997). Some studies show mortality in female patients to be lower than in male patients but that the female mortality rate is catching up with that of men both with regard to natural and unnatural deaths (Høye et al., 2011). Other studies show mortality in female patients to be higher than in male patients (Laursen et al., 2013; Olfson et al, 2015) while the relevant data from Finland shows no difference between the sexes (Tanskanen et al., 2018). Moreover, meta-analyses based on several studies have shown no significant difference between the sexes (McGrath et al., 2008; Saha et al., 2007).

2.5.1 Suicide mortality in schizophrenia spectrum disorders

Psychiatric disorders are known to be a significant cause of mortality due to suicide (Chesney et al., 2014). As a result of varying research designs and follow-up periods, different studies on the suicide risk associated with psychotic disorders show a great variation in results. An extensive meta-analysis based on a number of studies observed a median SMR of 12.9 for mortality due to suicide (Saha et al., 2007) and studies have shown a lifetime schizophrenia suicide prevalence of around 5–10% (Palmer et al., 2005; Hor et al., 2010; Nordentoft et al., 2011; Sher et al., 2019).

Suicide risk associated with schizophrenia has been found to be concentrated in the younger age groups and the early stages of illness, and data from Finland showed the 15–29 age group to be at the highest risk (Rantanen et al., 2009; Hor et al., 2010; Sher et al., 2019). However, some studies do not associate suicide risk in schizophrenia patients with young age but rather indicate that a higher suicide risk is associated with the later onset of illness (Kuo et al., 2005; Reutfors et al., 2009). The relationship between age and suicide risk in patients with schizophrenia is somewhat unclear and differences observed in different studies may be related to research design and duration of follow-up periods as studies with a shorter follow-up period may show an emphasis on suicides in the younger age groups.

Other risk factors besides age have been examined in several studies. In addition to young age, the strongest risk factors include being young, male and having a high level of education and intelligence prior to illness, depression, prior suicide attempts, substance abuse and active hallucinations and delusions. Additional risk factors observed include illness-related agitation and restlessness, impulsive behaviour, fear of mental disintegration, poor treatment adherence, frequent short hospitalisations and hopelessness. Moreover, being single, deterioration of health, recent loss and suicide in the family have been shown to increase the risk (De Hert et al., 2001; Hawton et al., 2005; Hor et al., 2010).

The highest suicide risk in schizophrenia patients has been found to be during psychiatric treatment and during the first few weeks after being discharged from hospital, but the risk is shown to remain high for up to a year after the end of treatment. (Mortensen et al., 2000; Nicholas et al., 2001; Pompili et al, 2005). This elevated suicide risk has been thought to be linked with the alleviation of symptoms and gaining painful

awareness of illness. On the other hand, mortality due to suicide in schizophrenia spectrum disorders has been found to rapidly decrease as patients start to feel better after successful treatment; the risk decreases more slowly, however, in patients who also suffer from an SUD (Qin et al., 2005).

A 30-year follow-up study in Finland found that the number of suicides decreased in both the general population and in schizophrenia patients but the drop was proportionally even more pronounced in schizophrenia patients than in the general population (Tanskanen et al., 2018). In 1984, the SMR for schizophrenia patients in Finland was 11.0, while in 2014 it was only 6.6. Adequate treatment for schizophrenia and related comorbidities were identified as factors protecting schizophrenia patients from suicide (Hor et al., 2010). Individuals with an elevated suicide risk must be identified, and special attention should be paid to the treatment of any comorbid depression and SUD. It is vital for patients to adhere to treatment, and if a schizophrenia patient has not taken any antipsychotic medication after their first episode, they have a 37-fold suicide risk after being discharged from hospital (Tiihonen et al., 2006).

2.5.2 Accident mortality in schizophrenia spectrum disorders

Psychiatric disorders in general have been found to be associated with an elevated risk of accidental deaths, and it is estimated that there are several factors behind this, such as substance use, adverse drug reactions, risky behaviour, concentration difficulties and dizziness. In a Swedish study, accidents were found to be a more common cause of death than suicide, and the age-standardised accidental death risk in women with schizophrenia was found to be 4.6 times higher than in people with no schizophrenia while the corresponding risk in men was 5.9 times higher (Crump et al., 2013). When comorbid substance use was taken into consideration, the risk in women with schizophrenia was 2.9 times higher and 2.2 times higher in men with schizophrenia. Being male, single, unemployed and having a poor socioeconomic status were identified as risk factors for accidental deaths.

A Danish longitudinal study of 17530 schizophrenia patients between 1955 and 2011 found schizophrenia to be a strong independent factor in accidental deaths and that schizophrenia patients die more frequently in accidents than due to suicide (Hellemose et al., 2018). The accidental death risk in women with schizophrenia was found to be 10.5 times higher than in women with no schizophrenia, while the corresponding risk in men was 8.3 times higher. Substance use was found to be a significant contributing factor but, after adjusting for substance use, the risk in both women and men with schizophrenia was still 3.2 times higher compared to the background population. No particular connection was found between the accidental death risk and the time after diagnosis.

Another Danish study found that the SMR for accidental deaths in women with schizophrenia was 2.9 and 2.1 in men with schizophrenia (Hiroeh et al., 2001). A study conducted in the United States found the SMR for accidental deaths in patients with schizophrenia to be 3.2 (Olfson et al., 2015). Accidental deaths were found to be more common in men than in women, but the SMR was found to be lower for men, at 2.6, than for women, at 4.7. Accidental deaths were also found to be more common in middle-

aged people in comparison to people who were younger or older. Accidental deaths in people with schizophrenia were found to be more than twice as common as suicides.

A meta-analysis of several studies showed that the average SMR for accidental deaths in patients with schizophrenia was 3.3 (Saha et al., 2007). However, no statistically significant association with accidental deaths has been found in Finnish data for schizophrenia patients (Joukamaa et al., 2001).

2.5.3 Homicide mortality in schizophrenia spectrum disorders

The risk of psychiatric disorder patients becoming victim of homicide has been studied considerably less than mortality for other causes of death. A Danish study found that the SMR for homicide mortality in women with schizophrenia was 3.4 and 7.3 in men with schizophrenia (Hiroeh et al., 2001). This elevated homicide mortality was estimated to be a result of a number of factors, such as living in a more dangerous area, substance use, disturbing behaviour due to symptoms of illness, trouble identifying potential hazards, exposure to violence from other people suffering from psychiatric disorders, and also provoking deadly violence towards oneself. A Swedish study found that the SMR for homicide mortality in men with schizophrenia was 11.7 and 9.9 in women with schizophrenia (Osby et al., 2000).

A meta-analysis examining mortality in schizophrenia patients found that the homicide mortality SMR was 7.3 but that homicides only made up 1% of mortality in schizophrenia patients (Brown, 1997). However, an extensive study conducted in the United States did not show significantly elevated homicide mortality among schizophrenia patients, with the SMR being 1.1 (Olfson et al, 2015). The SMR for men was only 0.9 while the figure for women was 1.9. Homicide mortality was observed to increase by age as the SMR was 0.7 for the 20–34 age group, 1.3 for the 35–54 age group and 2.1 for the 55–64 age group. Moreover, people with schizophrenia were found to have a more than threefold risk of dying as a result of actions taken by the authorities, highlighting the need for further police training.

2.5.4 Natural causes of death associated with schizophrenia spectrum disorders

Excess mortality in relation to almost all diseases has been observed in schizophrenia patients and, in Finnish schizophrenia patients, disease-related mortality has been found to be around threefold compared to that of the general population (Saha et al., 2007; Kiviniemi et al., 2010; Laursen et al., 2013).

Studies have specifically shown excess mortality in relation to cardiovascular and respiratory diseases and cancers but which disease has been highlighted as the cause of death in a particular study has largely been dependent on the research design, the duration of follow-up and the age distribution of the study population (Bushe et al., 2010). When analysing mortality by various natural causes, it should be taken into consideration that the causes of death that are more concentrated in the younger age groups, such as suicides and accidents, decrease the share of diseases that typically have a later onset (Laursen et al., 2014).

One of the most common causes of death in schizophrenia patients are cardiovascular diseases (Bushe et al., 2010). The SMR calculated for cardiovascular diseases in

schizophrenia patients has varied between 2.0 and 3.6 in different studies (Saha et al., 2007; Brown et al., 2010; Olfson et al., 2015). A Finnish 30-year follow-up study observed an increase in cardiovascular disease mortality in schizophrenia patients: the SMR was 2.1 in 1984 and 2.6 in 2014 (Tanskanen et al., 2018). However, the share of cardiovascular deaths of all deaths in schizophrenia patients actually decreased during that time period but the share of cardiovascular deaths decreased even more among the general population leading to an increase in the SMR for schizophrenia patients. The study also found that suicides committed by schizophrenia patients decreased during the follow-up by up to 40%, which is then reflected in the share of different causes of death later in life.

Ischaemic heart disease is one of the most common cardiovascular diseases. Data from the United States has shown an SMR of 3.7 for ischaemic heart disease in schizophrenia patients while the figure was 1.6 in Denmark and 2.5 in Finland and Sweden (Olfson et al., 2015; Laursen et al., 2013). Various cerebrovascular diseases are common causes of death in schizophrenia patients but a meta-analyses based on several studies found an SMR of only 0.9 for cerebrovascular diseases (Saha et al., 2007). A study based on Nordic national data found the SMR for cerebrovascular diseases in schizophrenia patients to be 1.6 in Denmark, 2.4 in Sweden and 3.2 in Finland (Laursen et al., 2013).

A Finnish study found the most common causes of death in schizophrenia patients to be various circulatory system diseases for which the SMR was 3.9, and excess mortality was the highest among 20- to 24-year-olds (Kiviniemi et al., 2010). Gender differences in circulatory system disease mortality vary between different studies. A Finnish nationwide study that followed patients with onset of schizophrenia between 1995 and 2001 for five years found that the SMR for circulatory system diseases in women was higher at 5.1 than in men at 3.5 (Kiviniemi et al., 2010).

Most cases of cancer occur in the older age groups, and studies show no indication that these diseases would onset at a younger age when associated with schizophrenia (Bushe et al., 2010). Different studies have had varying results on the share of cancers in mortality due to different research designs. In some studies, cancer mortality was not found to be significantly elevated or was only slightly elevated in comparison to the general population. (Osby et al., 2000; Joukamaa et al., 2001; Heilä et al., 2005; Kiviniemi et al., 2010). Other studies have found the SMR to be slightly more elevated, ranging between 1.5 and 1.8 (Olfson et al., 2015; Brown et al., 2010; Nordentoft et al., 2013). A meta-analysis based on several studies showed that the SMR related to cancers was 1.4 (Saha et al., 2007). Finnish data covering a 30-year follow-up period showed that the SMR related to cancers in Finland rose from 1.5 reaching 1.9 in 2014 (Tanskanen et al., 2018).

The most common types of cancer in schizophrenia patients are lung and breast cancer, and long-term studies indicate that cancers are in reality nearly as deadly as cardiovascular diseases (Bushe et al., 2010). However, the results for different types of cancer differ greatly between studies. Some studies show lung cancer to be the cancer type with the highest mortality with an SMR of 2.4–2.7, while a meta-analysis based on several studies showed that lung cancer is only slightly more common than in the general population and less common than one could expect considering the number of smokers among schizophrenia patients (Brown et al., 2010; Olfson et al., 2015; Catts et al., 2008).

The results in relation to breast cancer also vary greatly between studies, and breast cancers are estimated to be only slightly more common in schizophrenia patients than in the general population (Bushe et al., 2009).

In addition to heart and vascular diseases and cancers, respiratory diseases come up in studies on excess mortality in schizophrenia patients. The SMR for COPD ranges from 3.9 to 9.9 in different studies and the SMR for influenza and pneumonia ranges from 7.0 to 8.4 (Olfson et al., 2015; Brown et al., 2010). Finnish data showed an SMR of 3.3 for respiratory tract diseases while a meta-analysis based on several studies showed that the SMR related to respiratory tract diseases was 3.2 (Kiviniemi et al., 2010; Saha et al., 2007).

The problem with studying disease-related mortality in schizophrenia patients is the many interfering factors, mainly smoking (Catts et al., 2008). Tobacco smoking is a known risk factor for heart and vascular diseases, cancers and respiratory diseases, and studies have shown that around 70% of schizophrenia patients smoke (de Leon et al., 2005; Brown et al., 2010; McCreadie et al., 2003). The fact that the SMR for these diseases is high, as described above, together with the prevalence of smoking in schizophrenia patients is a strong indication that smoking is a significant factor in the cause of excess mortality in schizophrenia patients, and it has been estimated that up to 70% of disease-related excess mortality is caused by smoking (Olfson et al., 2015; Brown et al., 2010).

In addition to the prevalence of smoking, over 70% of schizophrenia patients are overweight or obese, 41% are physically inactive and 53% have raised cholesterol (McCreadie et al., 2003). Physical activity among schizophrenia patients often consists of only walking, and the physical activity levels of those schizophrenia patients who have hardly any social contacts are particularly low (Daumit et al., 2005). It is estimated that, in addition to smoking, obesity as described above is a general risk factor for somatic diseases in people with schizophrenia and can lead to dyslipidaemia, insulin resistance, diabetes, and hypertension (Hennekens et al., 2005).

In addition to the prevalence of unhealthy lifestyles and physical illnesses in schizophrenia patients, it has been found that significant factors resulting in excess mortality include delayed diagnosis and insufficient treatment of diagnosed diseases (Laursen et al., 2012; Mitchell et al., 2010). Several studies have shown that chronic disorders go under-diagnosed in psychotic disorder patients when they seek treatment (Laursen et al., 2011; Briskman et al., 2012). Even though a Finnish study found that individuals with schizophrenia had higher heart disease mortality and a higher risk of hospitalisation for coronary heart disease, they were prescribed with lipid-lowering drugs only 0.47 times and antihypertensive drugs 0.37 times as often as the general population (Lahti et al., 2012). A link between the underprescription of cardiovascular drugs and the severity of the patient's psychiatric symptoms has been established so that those with more severe symptoms receive fewer prescriptions (Laursen et al., 2014).

In some studies, the adverse effects of the medication used to treat schizophrenia, in particular the side effects of second-generation antipsychotic medication, have also been estimated to increase excess mortality, especially as the medication is likely to cause weight gain (Saha et al., 2007; Mitchell et al., 2006). An extensive meta-analysis conducted by the US Food and Drug Administration (FDA) examining the effects of increasing medication despite cardiovascular risk factors found that the use of antipsychotic agents did not increase mortality (Khan et al., 2013). A Finnish follow-up study based on

nationwide data covering a period between 1996 and 2014 found that the use of second-generation antipsychotic medication grew from 13% to 64% and that this did not lead to an increase in mortality in schizophrenia patients (Tiihonen et al., 2009). The long-term use of medication was found to be associated with lower mortality while the highest mortality was among those who did not take medication. A Finnish follow-up study based on nationwide data covering 62000 patients from 1996–2014 made a similar finding (Taipale et al., 2020). The median duration of patient follow-up in the study was over 14 years, and the use of antipsychotic medication was found to be associated with reduced overall, suicidal, and cardiovascular mortality. Studies have shown that the antipsychotic drug clozapine, which is particularly associated with weight gain, is also associated with lower mortality than other antipsychotic medication (Hennekens et al., 2005; Tiihonen et al., 2009; Kiviniemi et al., 2013; Vermeulen et al., 2019; Taipale et al., 2020).

2.5.5 Mortality in schizophrenia spectrum disorders with comorbid SUD

Comorbid substance use in psychotic disorders has been found to be highly prevalent in studies, and a meta-analysis based on several studies found that 41.7% of schizophrenia patients have an SUD related to some psychoactive substance, excluding tobacco, that meets the criteria of harmful use or dependence syndrome (Hunt et al., 2018). A total of 48% of men with schizophrenia were found to have an SUD while the figure for women was 22%. The most common substance was cannabis, which was the cause of the SUD for 26.2% of schizophrenia patients while other illicit drugs were the cause of the SUD for 27.5% of patients. A total of 24.3% of patients had an alcohol-related SUD.

Comorbid substance use in psychotic disorders has been identified as an important risk factor for physical illnesses (Dickey et al., 2002). Many illicit drugs have been linked to major cardiovascular and cerebrovascular complications that predispose even young, physically healthy people to ischaemic cardiac or cerebral events or haemorrhage (Esse et al., 2011). No difference in mortality has been found between the use of opioids and stimulants albeit opioids more often lead to an overdose, which is the most common cause of death for people injecting drugs (Mathers et al., 2013). Tobacco smoking, which is often prevalent in individuals with SUDs, has also been found to be a significant factor behind the elevated somatic mortality associated with SUDs (Gallaghan et al., 2018). Schizophrenia patients with an alcohol use disorder were found to suffer from hypertension, coronary artery disease and COPD twice as often as schizophrenia patients without an alcohol use disorder (Batki et al., 2009). An SUD has also been identified as an independent risk factor for suicidal behaviour in psychotic disorder patients, and suicide attempts are common in psychotic disorder patients with comorbid SUDs (Suokas et al., 2010).

However, studies have produced differing results on the effect of SUDs on mortality in psychotic disorder patients. Norwegian data showed an SMR of 4.4 for schizophrenia, 6.6 for SUD and 7.4 for patients with both schizophrenia and SUD (Heiberg et al., 2018). Danish data showed an SMR of 3.6 for schizophrenia patients and 8.5 for patients with both schizophrenia and SUD (Hjorthøj et al., 2015). Cannabis use was associated with an elevated suicide risk and all psychoactive substances, but especially hard drugs and the

combination of hard drugs and alcohol, were associated with an elevated risk of accidental death. A number of other studies have also shown higher mortality in subjects with both schizophrenia and co-occurring SUD than in subjects with schizophrenia but not SUD (Rosen et al., 2008; Schmidt et al., 2011; Björkenstam et al., 2012).

On the other hand, Icelandic data has shown that schizophrenia with comorbid SUD only increased mortality in men but not in women (Steingrímsson et al., 2016). A study conducted in the United States found that psychotic disorder patients who used cannabis had lower mortality than psychotic disorder patients who did not use cannabis, and also that an alcohol-related SUD did not increase mortality (Koola et al., 2012). A Finnish study found that comorbid SUDs increase alcohol-related mortality only in male patients with psychotic disorders (Lumme et al., 2016).

A number of studies have examined mortality in an SUD population by comparing mortality among those with or without a psychotic disorder. A Danish study found that a psychotic disorder did not increase mortality other than in amphetamine and cocaine users, who had an SMR of 3.6 associated with the SUD itself and an SMR of 9.5 when patients also had comorbid schizophrenia (Arendt et al., 2011). English data showed that individuals with opioid use disorder had over four times greater mortality compared to the general population but schizophrenia was not associated with this increased mortality (Bogdanowicz et al., 2015). Swedish data, covering a period of over 30 years, did not show any effect of co-occurring psychosis on mortality in a cohort of drug users, and the number of SUD-related deaths was found to be even smaller in the psychotic disorder group (Nyhlén et al., 2011a, 2011b). However, suicide as a cause of death was pronounced in the psychotic disorder group as 32% of people who had committed suicide had had a psychotic disorder while only 14% of the entire cohort had a psychotic disorder.

2.6 MORTALITY IN FORENSIC PSYCHIATRIC PATIENTS

The treatment of forensic psychiatric patients has been studied surprisingly little considering the general interest in the topic, and the underlying reason for this is thought to have been the methodological difficulties related to the topic. While psychiatric research often examines data related to certain diagnostic patient groups or certain therapeutic content, it is more difficult to study data on forensic psychiatric patients and compare data between countries due to differences in patient groups and resultant differences in therapeutic approaches (Salize et al., 2005).

Even the basic terminology for assessing patients' mental state or meeting the criteria for forensic psychiatric treatment varies greatly from one EU member state to the next. The terminology used to describe a person's mental state during the assessment of treatment needs is often non-specific and only loosely related to the official diagnostic classification systems that are generally used in psychiatric assessments, such as the Diagnostic and Statistical Manual of Mental Disorders (DSM) or the International Classification of Diseases (ICD). Such vague psychiatric terminology used when ordering people to undergo forensic psychiatric treatment in different EU member states includes mental illness (not defined), mental deficiency, severe mental unbalance, mental flaw, other disability of mind and other abnormal mental conditions. The non-specific

nature of these terms has been seen to allow for wide interpretation by experts conducting forensic psychiatric assessments or by courts, which leads to different application of the terminology and hence difficulty in comparing forensic psychiatric patient data (Salize et al., 2005).

The practices for ordering psychotic disorder, mood disorder and organic mental disorder patients to attend treatment are in many ways uniform in the different EU member states but legal procedures and post-conviction placement procedures can vary greatly (Salize et al., 2005). There are major variations in placements, especially with regard to dependence syndrome, personality disorders and paraphilia. National differences in forensic psychiatric care systems should be taken into account when comparing the results of studies carried out in various countries with regard to mortality in forensic psychiatric patients.

An English study included 595 patients who had been committed to forensic psychiatric treatment between 1983 and 2003 (Clarke et al., 2011). A total of 67.2% of these patients had a mental disorder, 26.6% had a psychopathic disorder, 3.5% had a mental disorder and a psychopathic disorder or intellectual disability and for 2.7% there was no known reason. The median treatment duration was 164 days. A total of 57 patients died during the follow-up that ended in 2003. The average age at death was 43.6 years and 39 years for those who committed suicide. Seven of the deaths occurred during forensic psychiatric treatment when the patient had been admitted for the first or second time. The all-cause and suicide mortality SMRs found in this study are presented in Table 1. Moreover, the data showed an SMR of 3.1 for natural deaths and 19 for unnatural deaths. The majority of those treated for a mental disorder had a psychotic disorder, mainly schizophrenia. In this group, the all-cause mortality SMR was found to be 6.3 while the SMR for suicide mortality was 35.5. For those treated for a psychopathic disorder, the all-cause mortality SMR was found to be 4.6 while the SMR for suicide mortality was 18.9.

In a Swedish study, the data consisted of 88 forensic psychiatric patients who had been discharged between 1992 and 2007 and were followed up until the end of 2008 (Tabita et al., 2012). A total of 49% of patients were diagnosed with schizophrenia or a psychotic disorder. An SUD was the primary or secondary diagnosis in 43% of patients. The median duration of treatment was 3.6 years when the primary diagnosis was schizophrenia, 1.7 years when it was psychotic disorder, 2.2 years with mood disorder and 3.1 years with personality disorder. A total of 20 of the patients included in the data died during follow-up and the average time from discharge to death in these cases was 3.9 years. Of these deaths, 55% were natural deaths, 30% were suicides. 10% were suspected suicides and 5% were caused by substance use. A total of 55% of those who died had been diagnosed with schizophrenia or some other psychotic disorder and 53% had SUD as a primary or secondary diagnosis. The all-cause mortality SMRs found in this study are presented in Table 1.

The data in a Japanese study consisted of 966 forensic psychiatric patients who had been followed up after discharge for an average of 790.2 days (range 3–1826) (Takeda et al., 2019). During follow-up, 17 patients died, and the average time from discharge to death in these cases was 480 days. A total of 10 of the deaths were suicides and only 3 were natural deaths. The all-cause and suicide mortality SMRs found in this study are presented in Table 1. A total of 785 (81.3%) of the patients included in the data had a

psychotic disorder. Of the patients with a psychotic disorder, 14 died during follow-up and 8 of these deaths were suicides. The all-cause SMR for psychotic disorder patients was 2.6 (1.3 for men and 8.5 for women). The suicide SMR for psychotic disorder patients was 17.7 (7.3 for men and 91.6 for women).

An English study, including 5955 patients who had attended forensic psychiatric treatment between 1972 and 2000, also examined the share of suicides in mortality figures (Jones et al., 2011). In 54.1% of the cases the cause for treatment was a mental disorder, 24.6% had a psychopathic disorder, 18.3% had intellectual disability and 3% had both a mental and psychopathic disorder. Some of the patients had several hospitalisations during the study and the median total duration of treatment was 6.9 years (range 0.1–29 years). During the study, the forensic psychiatric treatment of 4393 patients ended, and the median follow-up time in the study was 11.5 years (range 0.1–28.2 years). A total of 78 suicides were committed during the forensic psychiatric treatment and 140 suicides after the treatment had ended. The highest number of suicides was observed during the first two years after the end of treatment. The SMRs for suicide during and after treatment are included in Table 1.

Another Swedish study included 6505 patients discharged from forensic psychiatric care between 1973 and 2009 with a median follow-up time of 15.6 years (Fazel et al., 2016). A total of 10.8% of the patients were women while 89.2% were men. The median duration of the forensic psychiatric treatment was 5.1 months (range 1.7–12.7 months). The primary diagnosis was a schizophrenic disorder in 33.6%, bipolar disorder in 4.9%, depression in 4%, SUD in 17.1% and personality disorder in 25.8% of patients. During follow-up, 1948 (30%) of the patients died, and the deaths occurred at the age of 52 on average. A total of 443 of the deaths occurred within five years of discharge while 839 of the deaths occurred within ten years of discharge. Of these deaths, 1.8% were recorded as homicides, 22.7% as suicides and 14.2% as accidental deaths. Mortality was found to be 1916 cases per 100000 person-years, and, where schizophrenia co-occurred with an SUD, it was found to increase the risk of death.

A meta-analysis of several studies showed that, with regard to mortality among forensic psychiatric patients, the CDR was 1538 per 100000 person-years (Fazel et al., 2016). A meta-analysis examining mortality in released prisoners showed a differing CDR of 850 (Zlodre et al., 2012) while the CDR of 1417 for schizophrenia patients (Dutta et al., 2012) was found to be similar to that observed in forensic psychiatric patients. This was understood to indicate that the elevated mortality observed in forensic psychiatric patients was due to their psychiatric disorder rather than their criminal background. The underlying factors behind the elevated mortality observed in forensic psychiatric patients were concluded to be the same as in any other psychiatric patients. With regard to risk factors, studies have also highlighted that having a criminal background can carry a stigma which makes it more difficult to find employment and housing and to maintain social networks, which can lead to poverty and social exclusion (Davies et al., 2007).

In a Danish study the mortality of 490 male forensic psychiatric patients, who were committed to the forensic psychiatric treatment during years 1980–1992, was compared to the mortality of 490 age matched psychiatric male patients and 1716 male general population controls (Uhrskov Sørensen et al, 2020). Mean follow up in the study was 19 years. Of the psychiatric and forensic psychiatric patients, 63% had a diagnosis of major

psychiatric disorder (schizophrenia, schizotypal, delusional disorders or a mood disorder including bipolar disorders), 19% had a personality disorder and 18% had another psychiatric disorder as a primary diagnosis. The crude mortality rate was 2240 per 100 000 person-years for forensic psychiatric patients, 1920 for non-psychiatric patients and 750 for general population. When risk factors such as age, education, immigrant background, employment or being a student, length of the inpatient treatment and SUDs were noted, the higher mortality for forensic psychiatric patients compared to the psychiatric patients no longer remained. Also, there was not any significant difference in cause-specific mortality between forensic and non-forensic psychiatric patients. Having a diagnosis of SUD was noted to be a moderately strong independent risk factor in mortality and long inpatient treatment periods were also associated with increased mortality. Treatment as such was not thought to be the cause of higher mortality but it was likely to reflect the additional risks such as more severe mental illness, medication non-adherence and SUD. The findings of this study also indicated that it is the mental illness itself that causes the increased mortality rather that the forensic psychiatric context.

Table 1. All-cause and suicide mortality SMRs found in forensic psychiatric patients in studies.

		N	Deaths	SMR, all causes	SMR, suicides
Clarke et al., 2011	all (95% CI)	595	57	6.0 (4.5-7.7)	32.3 (19.2-51.1)
	- female (95% CI)	93	13	9.8 (5.2-16.7)	72.1 (14.9-210.7)
	- male (95% CI)	502	44	4.8 (3.5-6.4)	21.1 (11.8-34.8)
Tabita et al., 2012	all (95% CI)	88	20	10.4 (6.4-16.1)	–
	- female (95% CI)	8	3	40.5 (8.3-118.3)	–
	- male (95% CI)	80	17	9.2 (5.3-14.8)	–
Takeda et al., 2019	all (95% CI)	966	17	2.2 (1.3-3.5)	17.9 (8.6-32.9)
	- female (95% CI)	227	7	5.7 (2.3-11.7)	79.4 (25.8-185.2)
	- male (95% CI)	739	10	1.2 (0.6-2.2)	7.7 (2.5-18.0)
Jones et al., 2011 (only suicides during or after treatment)	all	5955	78 *	–	–
	- female (95% CI)	1134	28 *	–	40.1 (25.3-55.0)*
	- male (95% CI)	4821	50 *	–	6.6 (4.8-8.5)*
	all		140 **	–	–
	- female (95% CI)		25 **	–	44.9 (27.3-62.5)**
	- male (95% CI)		115 **	–	23.3 (19.0-27.5)**

SMR: Standardised mortality ratio
*: suicides committed during forensic psychiatric treatment
**: suicides committed after the end of forensic psychiatric treatment
–: not reported

3 AIMS OF THE STUDY

The aim of this thesis was to study mortality in Finnish forensic psychiatric patients. Prior studies on mortality in forensic psychiatric patients were poorly comparable to Finnish forensic psychiatric patient data as the older data included other patients than just psychotic disorder patients and the median durations of treatment in these studies also differed greatly from the norm in Finland. More specifically the aims were:

1. to examine the all-cause mortality of Finnish forensic psychiatric patients and to determine if the patient's age at the time of commitment to treatment is a factor that affects mortality in comparison to that of the general population;

2. to examine mortality in Finnish forensic psychiatric patients by cause of death and to review mortality figures during and after treatment; and

3. to examine mortality in Finnish forensic psychiatric patients after the end of treatment by cause of death and to review the impact of pre-treatment SUDs on mortality.

The purpose of studying mortality in forensic psychiatric patients and the relevant underlying factors is to provide information on the basis of which the Finnish forensic psychiatric care system can be further developed and the mortality gap between forensic psychiatric patients and the general population minimised. In addition to the Finnish forensic psychiatric care system, this research data is also useful for the development of forensic psychiatric care systems in other countries, especially with regard to psychotic disorder patients.

4 SUBJECTS AND METHODS

4.1 STUDY I: MORTALITY AMONG FORENSIC PSYCHIATRIC PATIENTS IN FINLAND

The study population consisted of the patients committed to compulsory forensic psychiatric hospital treatment in Finland from 1980 to 2009. The mental state of all patients included in the data was examined by THL in accordance with a court order. The patients had been diagnosed with a psychotic disorder during their forensic psychiatric examination and had been found criminally irresponsible for the crime for which they were ordered to attend a forensic psychiatric examination. The patients had been committed to involuntary forensic psychiatric treatment instead of being sentenced to prison. The data was collected from the minutes of meetings of the THL Board for Forensic Psychiatric Affairs which show all patient cases reviewed by the Board. Decisions on referrals to forensic psychiatric treatment were made by this Board.

A total of 1253 patients were committed to forensic psychiatric treatment between 1980 and 2009. Of this figure, 153 (12.2%) were women and 1100 (87.8%) were men. The median age for patients at the time of commitment to treatment was 37 years. Each patient was followed starting from the date on which the THL Board for Forensic Psychiatric Affairs referred them to treatment and the follow-up continued until 31 December 2011 or until the patient's death. The median follow-up time of the patients included in the data was 15.1 years. The median duration of treatment for the 795 male patients whose treatment ended during the follow-up time was 4.5 years. The 119 women whose treatment ended during the follow-up period had a median duration of treatment of 3.9 years.

In order to analyse the mortality data, the personal identity code of each patient included in the cohort was linked with the Statistics Finland register, which includes all deaths in Finland. The activities of Statistics Finland are regulated by the Statistics Finland Act. The SMR was calculated on the basis of the deaths observed during the follow-up period in relation to the mortality rate, which, based on Statistics Finland's data, was the age- and sex-standardised mortality ratio in the general population during the corresponding periods. The SMR was calculated as the ratio of deaths observed and deaths expected based on the mortality data for the general population.

This study was purely registry based and no contacts were made with the subjects of the study. The study was approved by THL and by Statistics Finland.

4.2 STUDY II: CAUSE-SPECIFIC MORTALITY IN FINNISH FORENSIC PSYCHIATRIC PATIENTS

The patient data in this study was the same as in study 1. Of this 1253 patient population, THL Board for Forensic Psychiatric Affairs ended the forensic psychiatric treatment of 832 patients during the follow-up period which ended on 31 December 2011. The median treatment duration for patients who were discharged by THL's decision was 5.9 years. A

total of 723 of the discharged patients were men, and their median treatment duration was 6.1 years. A total of 109 of the discharged patients were women, and their median treatment duration was 4.8 years.

The study analysed the causes of death in forensic psychiatric patients. Furthermore, deaths in each cause category were divided into deaths that occurred during and after treatment.

Deaths that occurred during the follow-up period of this study were also examined using the cause of death register provided by Statistics Finland. The death certificates of those who died during the follow-up period were reviewed for the recorded cause of death and these deaths were categorised as caused by a somatic disease, suicide, accident or homicide. The SMR was calculated on the basis of deaths in different cause of death categories in relation to the mortality rate, which, based on Statistics Finland's data, was the age- and sex-standardised mortality ratio among the general population in the corresponding cause of death categories and during the corresponding time periods. The SMR was calculated as the ratio of deaths observed and deaths expected based on the mortality data for the general population and using the person-year method, 95% confidence interval and Poisson distribution.

This study was purely registry based and no contacts were made with the subjects of the study. The study was approved by THL and by Statistics Finland.

4.3 STUDY III: SUBSTANCE ABUSE AND EXCESSIVE MORTALITY AMONG FORENSIC PSYCHIATRIC PATIENTS IN FINLAND

The patient data in this study was the same as in studies 1 and 2. The follow-up of the 1253 forensic psychiatric patients continued until 31 December 2016. The treatment of 950 patients ended during the follow-up by a decision of the THL Board for Forensic Psychiatric Affairs. All patients included in the data had a psychotic disorder, mostly (87%) in the schizophrenia spectrum (ICD-10: F20-29). Of these, 59% had schizophrenia (F20.x), 13% had a delusional disorder (F22.x) and 9% had a schizoaffective disorder (F25.x). The other most common psychiatric disorder groups were psychotic mood disorders (F30–39) in 7% and organic brain syndromes (F0–9) in 3%. A total of 823 (86.6%) of the patients were men and 127 (13.4%) were women. The mean treatment duration for these discharged patients was 6.7 years, and the mean follow-up time from the end of treatment to the end of the follow-up period or to the patient's death was 13.4 years.

Any SUDs diagnosed during the patients' forensic psychiatric examinations were noted and the forensic psychiatric examination statements were reviewed by Ilkka Ojansuu in order to identify any SUDs that were described in the statement but for which no diagnosis was given. Any patient with evidence of substance dependence syndrome or harmful use (ICD-10: F1x.1–F1x.2) was counted as having an SUD regardless of the substance. Based on the collected data, the patients were divided into two groups based on whether they were suffering or not suffering from SUD at the time of the forensic psychiatric examination. The non-SUD group included those patients for whom there was evidence in the forensic psychiatric examination statement of only intoxication or withdrawal symptoms without a longer standing substance abuse disorder, patients

with only prior evidence of SUDs without current use and patients without any evidence of an SUD.

Deaths of patients that occurred during the follow-up period were reviewed using the cause of death register provided by Statistics Finland. The deaths in the data were categorised based on the cause of death retrieved from the cause of death register into somatic diseases, suicides, accidents, homicides, or unclear. Moreover, information on any signs of substance use at time of death recorded on death certificates was collected. Mortality in the patients was analysed both as a whole and categorised into patients who had been reported suffering or not suffering from an SUD in their forensic psychiatric examination. The comparative data used to calculate the relevant SMR was the age- and sex-standardised mortality ratio among the general population in the corresponding cause of death categories and during the corresponding time periods retrieved from Statistics Finland. The SMR was calculated as the ratio of deaths observed in the data and deaths expected based on the mortality data for the general population and using the person-year method, 95% confidence interval and Poisson distribution. The Cox proportional hazards model was used to calculate the age adjusted hazard ratios for death and adjusted survival function. A competing-risks regression model was used to estimate the adjusted subhazard ratios and cumulative incidence in the presence of competing risks.

This study was purely registry based and no contacts were made with the subjects of the study. The study was approved by THL and by Statistics Finland.

5 RESULTS

5.1 STUDY I

Of the 1253 patients included in the data, 351 (28%) died during the follow-up, and mortality among forensic psychiatric patients was found to be threefold in comparison to the general population. The mean age and SMR for all-cause mortality as well as for male and female mortality are presented in Table 2.

Mortality was also analysed by dividing patients into different age groups according to the age when they were committed to treatment. Patients who had been over 40, 50 or 60 years of age when referred to treatment did not differ significantly with respect to mortality as SMR values ranged between 2.3 and 2.6 in these age groups. Patients who had been 30–39 years of age when referred to treatment had a much higher SMR at 3.7 (95% CI 3.0-4.6) while the SMR for those referred to treatment when under 30 years of age was even higher at 4.8 (95% CI 3.8–6.1).

5.2 STUDY II

Table 2 presents the SMRs of the 351 deceased forensic psychiatric patients who were included in the data for study 1 divided between natural deaths, suicides, accidents and homicides. Table 2 also presents the mean age for all-cause mortality and causes of death as described above.

The most common natural causes of death were heart and vascular diseases, cancers and respiratory diseases. A total of 61 (24%) of the deaths due to somatic diseases occurred during treatment, and the median duration of treatment at death was 4.2 years (range 0.02–24.1 years). A total of 188 (76%) of the deaths due to somatic diseases occurred after treatment, and the median time after discharge at death was 8.7 years (range 0.1–27.7 years). Deaths due to somatic diseases showed a clear growth after discharge and the number of deaths kept rising for a long period of time.

A total of 31 (53%) suicides had been committed during forensic psychiatric treatment, and the median duration of treatment at death was 2.1 years (range 0.1–14.2 years). A total of 28 (47%) suicides had been committed after discharge from forensic psychiatric care, and the median time after discharge at death was 3.4 years (range 0.1–17.3 years). The number of suicides peaked in the first five years of starting treatment and after discharge. The most common methods of suicide were hanging and overdose.

Three (9%) of the accidental deaths had occurred during forensic psychiatric treatment, and the median duration of treatment at death in these cases was 7.7 years (range 2.0–19.1 years). A total of 29 (91%) of the accidental deaths had occurred after discharge from forensic psychiatric treatment, and the median time after discharge at death was 7.3 years (range 0.9–20.2 years).

One (25%) of the homicides had occurred during forensic psychiatric treatment after 1.2 years in treatment. For the three (75%) homicides that had occurred after discharge, the median time after discharge at death was 7.4 years (range 0.9–20.2 years).

Despite information on the deaths and autopsies, the cause of death remained unclear in seven (2%) cases.

5.3 STUDY III

Of the 950 patients included in the data, 354 (37%) died during the follow-up period. A total of 264 (75%) of these deaths were natural and 80 (23%) were unnatural (accident, suicide or homicide). In ten (3%) cases, the cause of death remained unclear even after a forensic medical examination. The SMR for all-cause mortality is presented in Table 2.

A total of 567 (60%) of patients included in the data were noted as suffering from a comorbid SUD according to ICD-10 criteria (either dependence syndrome or harmful use) in conjunction with their psychotic disorder during their forensic psychiatric examination. Of these 567 patients with SUD, 395 (70%) had been diagnosed as such during their forensic psychiatric examination and 172 (30%) patients had evidence of SUD in their forensic psychiatric examination statement albeit no diagnosis. During the follow-up, 218 patients with SUD and 136 patients without SUD died. The SMRs for SUD patients and non-SUD patients are presented in Table 2.

Among men, the age-adjusted proportion of death was significantly higher among those with an SUD but this trend was not found in women. The higher mortality among men with an SUD was not associated with natural deaths but was more clearly linked with unnatural deaths.

In 56 (16%) of the 354 deaths, evidence of current substance use was recorded on the death certificates, such as evidence of intoxication or withdrawal symptoms or that the deceased had been found with items for substance use. Of these 56 deceased, 47 (84%) already showed signs of an SUD during their forensic psychiatric examination.

Of the patients who died a natural death, 10 (4%) had been recorded as alcohol-related deaths: three liver cirrhosis, three heart diseases, one combined liver cirrhosis and heart disease, one dementia and two SUDs. A total of 28 (64%) unnatural deaths were substance-related accidents. Fifteen of these deaths were attributable to substance overdoses or substance poisonings. Furthermore, four individuals had choked on food, two had died of subdural haemorrhage, one had frozen to death, one had drowned, one had died due to carbon monoxide poisoning, and one had suffocated after passing out in an awkward position, all while intoxicated. Three deaths happened during the withdrawal stage: one patient had frozen to death, one died of a subdural haemorrhage, and one due to clozapine poisoning. In the unclear cases, five out of ten showed evidence of substance use.

Table 2. Mortality in forensic psychiatric patients.

Persons committed to compulsory forensic psychiatric treatment in 1980–2009	**All**	**Male**	**Female**
Deaths during treatment and after discharge (during a follow-up period from 1980 to 2011)	351	318	33
-SMR (95% CI)	2.97 (2.67–3.29)	2.91(2.61–3.25)	3.62 (2.57–5.09)
-Mean age at death (range)	56.2 (19.8–87.8)	56.1 (20.3–87.8)	57.0 (19.8–84.3)
Natural deaths	249	223	26
-SMR	2.6 (2.3–2.9)	2.5 (2.2–2.9)	3.1 (2.1–4.6)
-Mean age at death (range)	61.1 (20.3–87.8)	60.7 (20.3–87.8)	64.1 (43.3–84.3)
Suicide	59	53	6
-SMR (95% CI)	7.1 (5.5–9.2)	6.6 (5.1–8.7)	19.5 (8.8–43.4)
-Mean age at death (range)	40.2 (19.8–76.7)	41.3 (21.0–76.7)	30.7 (19.8–38.0)
Accidental death *	32	31	1
-Mean age at death (range)	51.9 (32.2–81.8)	52.5 (32.3–81.8)	32.2 (32.2–32.2)
Homicide *	4	4	0
-Mean age at death (range)	39.5 (32.8–50.8)	39.5 (32.8–50.8)	
Accidental death or homicide *	36	35	1
-SMR (95% CI)	1.7 (1.2–2.4)	1.8 (1.3–2.5)	1.3 (0.2–8.9)
Death after discharge (follow-up in 1980–2016)	354	320	34
-SMR	3.5	–	–
Death after release, SUD	218	–	–
-SMR	4.1	–	–
Death after release, no SUD	136	–	–
-SMR	2.8	–	–

–: not reported

*: SMR was calculated in a combined section of homicides and accidental deaths in an effort to increase statistical power

5.4 UNPUBLISHED RESULTS

Of the 351 deceased forensic psychiatric patients who were included in the data for studies 1 and 2, 96 (27.4%) deaths occurred during forensic psychiatric treatment and 255 (72.6%) occurred after discharge. Most of the deaths due to natural causes (N 188, 75.5%) occurred after discharge. A little over half (N 31, 52.5%) of t he suicides occurred during forensic psychiatric treatment. Most of the homicides (N 3, 75%), accidental deaths (N 29, 90.6%) and deaths that remained unclear (N 7, 100%) occurred after discharge. Table 3 presents different causes of death during forensic psychiatric treatment and after discharge.

Table 3. Deaths during forensic psychiatric treatment and after discharge.

	N	Inpatient N (%)	Outpatient N (%)
Somatic disease	249	61 (24.5)	188 (75.5)
Heart and circulatory system disease	110	26 (23.6)	84 (76.4)
Respiratory system disease	30	8 (26.7)	22 (73.3)
Cancer disease	63	16 (25.4)	47 (74.6)
Other somatic disease	46	11 (23.9)	35 (76.1)
Suicide	59	31 (52.5)	28 (47.5)
Homicide	4	1 (25.0)	3 (75.0)
Accidental death	32	3 (9.4)	29 (90.6)
Cause of death unclear	7	0 (0)	7 (100)
All causes of death	351	96 (27.4)	255 (72.6)

Of the 351 deaths were 59 due to suicides. Most common suicide method was hanging (N 27, 45.8%) and most of these (74.1%) occurred during forensic psychiatric treatment. Second most common suicide method was drug overdose (N 15, 25.4%) and most of these (73.3%) occurred after discharge. Of the 59 suicides were 53 (89.8%) committed by male patients and only six (10.2%) by female patients. Hanging was the most common suicide method of male patients (N 25, 47.2%) and most of these (N 18, 72.0%) were committed during the forensic psychiatric treatment. Second most common suicide method of male

patients was drug overdose (N 14, 26.4%) and most of these (N 10, 71.4%) were committed after discharge. Of the six suicides committed by female patients were four (66.7%) committed during forensic psychiatric treatment. None of the suicide methods were found to be distinctly more common among female patients. Table 4 presents how suicides were divided between genders and time during forensic psychiatric treatment and time after discharge. SMR for suicides during forensic psychiatric treatment was 7.39 (95% CI 5.2–10.5) and after discharge 4.13 (95% CI 4.7–9.8).

Table 4. Suicides during treatment and after discharge.

	N	Inpatient N (%)	Outpatient N (%)
Suicide by hanging, all	27	20 (74.1)	7 (25.9)
Male	25	18 (72.0)	7 (28.0)
Female	2	2 (100)	0 (0)
Suicide by drug overdose, all	15	4 (26.7)	11 (73.3)
Male	14	4 (28.6)	10 (71.4)
Female	1	0 (0)	1 (100)
Suicide by jumping from a height, all	6	2 (33.3)	4 (66.7)
Male	4	1 (25.0)	3 (75.0)
Female	2	1 (50.0)	1 (50.0)
Suicide by drowning, all	4	3 (75.0)	1 (25.0)
Male	4	3 (75.0)	1 (25.0)
Female	0	0 (0)	0 (0)
Suicide by other means, all	7	2 (28.6)	5 (71.4)
Male	6	1 (16.7)	5 (83.3)
Female	1	1 (100)	0 (0)
All suicides	59	31 (52.5)	28 (47.5)

Of the 950 forensic psychiatric patients who were included in the data for study 3, 567 (60%) patients were noted as suffering from a comorbid SUD in conjunction with their psychotic disorder during their forensic psychiatric examination. The SMRs among 395 patients who had been diagnosed to have SUD in their forensic psychiatric examination and those 172 patients who had evidence of SUD in their forensic psychiatric examination statement albeit no diagnosis are presented in Table 5.

Table 5. Mortality in forensic psychiatric patients with SUD diagnosed in forensic psychiatric statement and those with evidence of SUD albeit no diagnosis

	N	Deaths	SMR (95% CI)
SUD diagnose in forensic psychiatric statement	395	149	4.4 (3.7–5.2)
Evidence of SUD albeit no diagnosis in forensic psychiatric statement	172	69	3.5 (2.8–4.5)

Studies 1 and 2 included a total of 1253 patients who were committed to forensic psychiatric treatment between 1980 and 2009. Of these patients, 351 (28%) died during the follow-up which continued until 31 December 2011. The trend in mortality observed in these studies is presented in Figure 1.

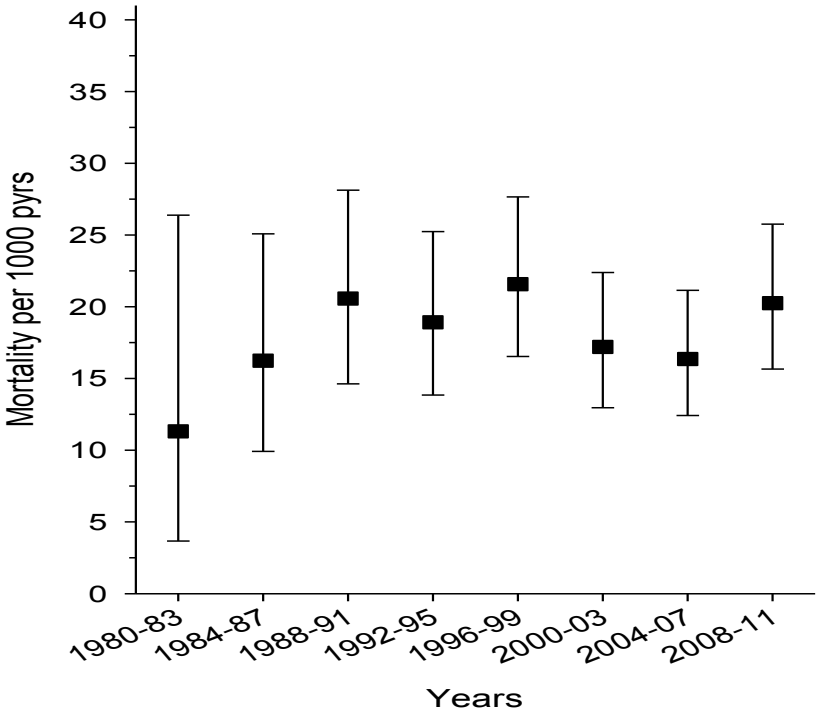

Figure 1. The trend observed in the mortality of forensic psychiatric patients in Finland during years 1980–2011.

6 DISCUSSION

6.1 ALL-CAUSE MORTALITY IN FORENSIC PSYCHIATRIC PATIENTS

The results of the study showed that all-cause mortality in Finnish forensic psychiatric patients was threefold in comparison to the general population. These results were similar to results from other countries that have reported SMRs of between 2.2 and 10.4 for forensic psychiatric patients (Clarke et al., 2011; Tabita et al., 2012; Takeda et al., 2019). However, comparing mortality in Finnish forensic psychiatric patients with the results of studies conducted in other countries on mortality in forensic psychiatric patients is problematic due to differences in patient data. In the Finnish legal system, a precondition for involuntary psychiatric treatment is a diagnosed psychotic disorder, while in these other countries, forensic psychiatric patients may have included people with conditions such as personality disorder or SUD but no psychotic disorder. Such diagnostic differences naturally affect the content of treatment and prognosis for patients.

The data from Finland showed that forensic psychiatric patients with a psychotic disorder had an SMR of 3.0, which is similar to the findings of a Japanese study in which the SMR for psychotic disorder patients was 2.6 (Takeda et al., 2019). However, an English study found that a cohort consisting mainly of schizophrenia patients had a considerably higher all-cause SMR of 6.3 (Clarke et al., 2011). In this English study, the median duration of treatment was only 164 days. A Swedish study, which found the all-cause SMR for forensic psychiatric patients to be 10.4, reported a median treatment duration of 3.6 years for schizophrenia patients and 1.7 for other psychotic disorder patients (Tabita et al., 2012). The duration of the forensic psychiatric treatment observed in these studies was significantly shorter than in the Finnish data, as our study found that the treatment of Finnish forensic psychiatric patients lasted on average 6.7 years before transferring to outpatient care. The longer treatment duration of Finnish forensic psychiatric patients may be one factor protecting them from excess mortality.

Our study showed an SMR of 3.0 for Finnish forensic psychiatric patients, which is similar to the SMR of 2.7 observed in Finnish schizophrenia patients under long-term follow-up (Tanskanen et al., 2018). This supports prior research outcomes that suggest that elevated mortality in forensic psychiatric patients is mainly a result of their psychiatric disorder (Fazel et al., 2016; Uhrskov Sørensen et al., 2020). In our study, the relative all-cause mortality of forensic psychiatric patients was found to be inversely comparable to the patient's age at the time of commitment to treatment. It is intuitive to think that treatment initiated at a younger age would be a protective factor that reduces risky behaviour and hence decreases mortality. However, forensic psychiatric treatment initiated at an early age can also be indicative of earlier onset of the psychotic disorder linked with a worse manifestation of the disorder and poorer prognosis, which would coincide with other observations on schizophrenia patients (Clemmensen et al., 2012).

Mortality among forensic psychiatric patients in Finland was noted to slightly increase during years 1980–1991 but not explicit transition in mortality was observed during the study years.

6.2 MORTALITY BETWEEN THE SEXES IN FORENSIC PSYCHIATRIC PATIENTS

Several studies have shown that there is no significant difference in mortality between men and women with schizophrenia (McGrath et al., 2008; Saha et al., 2007; Tanskanen et al., 2018). However, a significant gap in mortality between the sexes in forensic psychiatric patients was found in Swedish data, which showed an SMR of 40.5 for women and 9.2 for men (Tabita et al., 2012). A Japanese study also showed an SMR of 5.7 for female patients, which was many times higher than the SMR of 1.2 for men (Takeda et al., 2019). In our study, the SMR for female patients was 3.62 while the SMR for male patients was 2.91. The difference between sexes in Finnish forensic psychiatric patients was considerably smaller than shown in prior studies on forensic psychiatric patients albeit similar to what has been observed in general in schizophrenia patients. The difference between the mortality figures for men and women observed in our study in comparison to the corresponding figures in relation to forensic psychiatric patients in other countries may be explained by the very small size of the patient cohorts in these other studies. The Swedish data included the deaths of only three women while the Japanese data included the deaths of seven female patients. Comparing mortality in this way is also problematic due to differences in the legal systems. Data in the studies from other countries include other patients than just psychotic disorder patients, and the deaths also may include e.g. patients who possibly had opioid dependence as the primary disorder and so had a significantly higher risk of death than patients with a psychotic disorder as their primary diagnosis (Saha et al., 2007; Mathers et al., 2013).

6.3 DISEASE-RELATED MORTALITY IN FORENSIC PSYCHIATRIC PATIENTS

The study showed an SMR of 2.6 for natural deaths in Finnish forensic psychiatric patients, which is similar both to the SMR of 2.4 found in a meta–analysis on natural deaths in schizophrenia patients and to the roughly threefold disease-related mortality in Finnish schizophrenia patients (Saha et al., 2007; Kiviniemi et al., 2010). The most common causes of natural death were diseases of the circulatory system and cancers, which is also true for the general population (Official Statistics of Finland, Causes of death 2011). One difference observed in the study was that respiratory diseases accounted for 8% of deaths among forensic psychiatric patients during follow-up, which was twice the number of deaths due to respiratory diseases recorded in the general population in 2011. This difference observed with regard to the general population may be due to smoking by forensic psychiatric patients, which many studies have shown to be prevalent (Dickens et al., 2005; Hehir et al., 2012).

Excess mortality associated with natural diseases in forensic psychiatric patients is likely to be caused by similar underlying factors as in schizophrenia patients, i.e. a

combination of unhealthy lifestyles, delayed diagnosis and insufficient treatment of diagnosed diseases (McCreadie et al., 2003; Hennekens et al., 2005; Laursen et al., 2012; Mitchell et al., 2010).

The study found that the majority of deaths resulting from somatic diseases appear after the end of treatment. The increase in the number of natural deaths after the end of hospital care may be due to the loss of protective factors such as a healthier lifestyle and other healthcare services that are provided during psychiatric treatment. It is also possible that sometimes forensic psychiatric treatment ended due to the patient's old age and severe somatic diseases, which is why deaths were more pronounced after the end of treatment.

6.4 SUICIDE MORTALITY IN FORENSIC PSYCHIATRIC PATIENTS

The greatest difference between forensic psychiatric patients and the general population was in suicide mortality, which was sevenfold in forensic psychiatric patients. Over half of the suicides occurred during forensic psychiatric hospital treatment, which reveals an obvious treatment failure in these cases. The number of suicides was found to increase during the first few years after the start and end of hospital treatment, which is a much longer period compared to psychiatric patients for whom the period of elevated suicide risk is the first few weeks after the start and end of treatment while continuing to be elevated for up to a year (Mortensen et al., 2000; Nicholas et al., 2001; Pompili et al, 2005). An English study on suicide mortality in forensic psychiatric patients found that the highest number of suicides occurred in the first two years after the end of treatment (Jones et al., 2011), which is a similar result to that found in our study albeit the risk remained elevated even longer in the Finnish data. These results suggest that the suicide risk in forensic psychiatric patients remains elevated after the end of treatment longer than in schizophrenia patients in general.

In forensic psychiatric patients, just as in schizophrenia patients in general, the elevated suicide risk is most likely linked with the alleviation of symptoms and gaining painful awareness of one's illness (Nicholas et al., 2001) but possibly also with remorse for having committed a crime and the effects of the crime on the patient's social network, which can be underlying factors in elevated suicide risk in forensic psychiatric patients. The long-term elevated suicide mortality after discharge from hospital may be caused by the loss of protective factors present in hospital care and difficulties adapting to life outside the hospital. Suicides that are committed years later may also be caused by new onset of the psychotic disorder and inadequate outpatient care. In order to reduce suicides, attention needs to be paid to factors that are known to increase the risk of suicide such as young age, high level of education prior to illness, depression, prior suicide attempts and active hallucinations and delusions (Hor et al., 2010). It is also important to recognize the factors that are known to decrease the risk, such as a safe ward environment, patient visibility and supervision, careful assessment, teamwork and awareness of the risk of suicide within the hospital (Sakinofsky 2014). The factors known to decrease the risk of suicide should also be considered prior to the discharge of the patients, such as withdrawing the intensive care gradually, useful daily activation and planning of seamless access to mental health services (De Hert et al, 2001; Meehan et al,

2006). The availability of long–term and extensive outpatient services after discharge from hospital should be ensured as this has been proven to reduce suicide mortality (Pirkola et al, 2005).

During forensic psychiatric treatment most of the suicides were hangings and most of the suicides after discharge were drug overdoses indicating that suicides are committed by means available. This highlights the importance of preventive actions such as safe hospital environment and safe prescription policies. SMR for suicides during forensic psychiatric treatment was higher (7.39) than after discharge (4.13) which could indicate that many of those in greater risk of suicide died already during forensic psychiatric treatment.

While the SMR of 7.1 for suicide mortality in Finnish forensic psychiatric patients is not acceptable, it is considerably lower compared to the results of prior studies on suicide mortality in forensic psychiatric patients. An English study found that the SMR for suicide mortality in forensic psychiatric patients during treatment was 6.6 in men and 40.1 in women, while the SMR after treatment was 23.3 in men and 44.9 in women (Jones et al., 2011). Another English study showed an SMR of 32.2 for suicide mortality in forensic psychiatric patients, while for patients whose primary diagnosis was schizophrenia the SMR was 35.5 (Clarke et al., 2011). Japanese data showed an SMR of 17.9 for suicide mortality in forensic psychiatric patients while the SMR was 17.7 in the patients in this group who had a psychotic disorder (Takeda et al., 2019). Compared to the results from these other countries, mortality in Finnish forensic psychiatric patients is several times lower. The possible underlying factor behind this difference is the longer treatment duration of Finnish patients, as higher suicide risk has been associated with shorter duration of hospital treatment (Qin et al., 2005).

The average age of patients who committed suicide among Finnish forensic psychiatric patients was 40.2 years, which is similar to the average age of 39 found in English data on forensic psychiatric patients but higher than the 15–29-year age group found in Finnish data of schizophrenia patients to have the highest risk (Clarke et al., 2011; Rantanen et al., 2009). This difference compared to the Finnish schizophrenia patients may be explained by differences in the patient cohort given that those schizophrenia patients who committed suicide at a very young age were not going to be committed to forensic psychiatric care since the average age of those committed to forensic psychiatric treatment was 37 years at the time of commitment. Moreover, the long follow-up time of our study was a factor that increased the average age of those who committed suicide.

The suicide mortality SMR of 7.1 observed in Finnish forensic psychiatric patients is lower than the median SMR of 12.9 observed in a meta-analysis of schizophrenia patients but similar to the suicide mortality SMR of 6.6 in Finnish schizophrenia patients (Saha et al., 2007; Tanskanen et al., 2018). Therefore, our study found that suicide mortality in Finnish forensic psychiatric patients was similar to that observed in schizophrenia patients. Over half of the suicides committed by forensic psychiatric patients occurred during hospitalisation, while only a small number of suicides by schizophrenia patients were committed during psychiatric hospital treatment (Pompili et al, 2005). Suicides by forensic psychiatric patients during hospitalisation are a sign of serious deficiencies in identifying patients at risk of suicide and in preventing the implementation of possible

suicide plans. In light of these results, the development of forensic psychiatric care is necessary in order to prevent suicides during and after treatment. There was no information available in our study on the circumstances surrounding the suicides that had been committed during hospitalisation. For example, did the suicide occur while the patient had fled the hospital? Further investigation into these serious treatment failures is needed so that the care system can be further developed. It can also be stated that, despite the long treatment times in forensic psychiatric patients, their suicide mortality is no lower than that of schizophrenia patients, which indicates that there is a need to improve the content of forensic psychiatric treatment.

6.5 ACCIDENT AND HOMICIDE MORTALITY IN FORENSIC PSYCHIATRIC PATIENTS

The study found that the combined SMR of 1.7 for accidental deaths and homicides was considerably lower than that of suicide mortality and even that of natural deaths. Accidental deaths and homicides, as well as suicides, were found to occur at a younger age on average than natural deaths, which means that more life years on average were lost in the cases of unnatural deaths. Accidental deaths in Finnish forensic psychiatric patients were no more common than suicides, which is a trend that differs from the observations on schizophrenia patients in general (Olfson et al., 2015; Hellemose et al., 2018). The SMR of 3.3 for accident mortality and SMR of 7.3 for homicide mortality in schizophrenic patients also found in meta–analyses were considerably higher than what was observed in our study in forensic psychiatric patients (Saha et al., 2007; Brown 1997). The longer treatment duration in Finnish forensic psychiatric patients may also protect them from accidental deaths and homicides. In hospital and during the follow-up period, substance use by patients is monitored and the circumstances of the patients are much more secure, which is likely to prevent accidents and homicide mortality. After discharge from involuntary treatment, many patients are likely to transfer into some form of supported accommodation, which means that their circumstances still protect them from these unnatural deaths. The accident mortality found in our study is similar to that found in Finnish schizophrenia patients for whom there is no statistically significant association with accidental deaths (Joukamaa et al., 2001). This is a potential indication that there is something about the Finnish care system or society that protects patients from these unnatural deaths.

The accident and homicide mortality observed in our study was most pronounced during the time after the end of treatment and remained so for a long time as the median for these deaths was as late as seven years after the end of treatment. There are possibly several different underlying factors behind these deaths, such as loss of the security provided by the hospital and follow-up care, neglect of treatment, substance use, new onset of psychiatric symptoms, weakened cognitive abilities due to a psychotic disorder and adverse drug reactions. The fact that the median for these deaths was as late as at seven years after the end of involuntary treatment suggests that psychiatric outpatient care possibly acted as a long–term protective factor against these causes of death.

6.6 MORTALITY IN FORENSIC PSYCHIATRIC PATIENTS WITH COMORBID SUD

In addition to a psychotic disorder, 59.7% of the patients included in our data had an SUD at the time of their forensic psychiatric examination. In Swedish data on forensic psychiatric patients, an SUD was the primary or secondary diagnosis in 43% of patients, and a meta-analysis found that 41.7% of psychotic disorder patients had a comorbid SUD (Tabita et al., 2012; Hunt et al., 2018). Considering these figures, the number of patients with comorbid SUD found in our study was considerably high among Finnish forensic psychiatric patients. The study also found that 30% of Finnish forensic psychiatric patients showing clear evidence of SUD during their forensic psychiatric examination had not been appropriately diagnosed. This can be an indication of serious deficiency in identifying and diagnosing SUDs and can lead to their inadequate treatment. SMR was 4.4 for those who were diagnosed with SUD in forensic psychiatric examination and for those who had evidence of SUD in their forensic psychiatric examination statement albeit no diagnosis SMR was 3.5. This difference could indicate that only those with more severe SUD were diagnosed in forensic psychiatric examination explaining higher mortality in that group. However, it is also important to notice that the difference between these groups was not statistically significant (p=0.12).

Our study identified the SUDs that patients had developed before treatment as clear underlying factors in the excess mortality found in forensic psychiatric patients. The results show that, even after reaching abstinence as a result of extensive forensic psychiatric treatment, men with SUD showed higher age–adjusted mortality than those with no SUD. This excess mortality is especially associated with unnatural deaths. The same trend could not be observed in women with SUD, which may reflect actual differences between the sexes or may simply be due to the smaller number of female patients in the data. Moreover, our study found that a large proportion of the deaths of forensic psychiatric patients occurred when the patient was intoxicated, which is a clear indication that substance use had reoccurred in these patients. However, information on any relapse was available only if there was a mention of it on the patient's death certificate. It is likely that there were far more relapses in reality.

Studies have come to varying conclusions on whether comorbid SUDs increase mortality. Our study showed an SMR of 4.1 for those with an SUD and an SMR of 2.8 for those without an SUD. This means that these differences in mortality were in line with the results of the Norwegian data that showed an SMR of 4.4 for schizophrenia patients and 7.4 for patients with both schizophrenia and SUD (Heiberg et al., 2018) and the Danish data that showed an SMR of 3.6 for schizophrenia patients and 8.5 for patients with both schizophrenia and SUD (Hjorthøj et al., 2015). A Swedish study also showed that schizophrenia with comorbid SUD increased mortality in forensic psychiatric patients (Fazel et al., 2016). Therefore, our study results support the observation made in these studies that schizophrenia with comorbid SUD increases mortality at least in forensic psychiatric patients. However, the SMRs in Finnish forensic psychiatric patients, with or without an SUD, were lower than in the abovementioned Norwegian and Danish studies, which is likely due to differences in research design and linked especially with the length of treatment of forensic psychiatric patients.

6.7 STATISTICAL DISCUSSION

We were able to study the mortality among Finnish forensic psychiatric patients reliably due to the large patient data and the long follow-up time. The number of the female patients was somewhat small but still representative since the collection of the person years was adequate in that group also. In this study SMR was used to compare mortality between the different populations. It needs to be noted that when SMRs reported from different countries are compared, the study population's mortality in each study is being compared to the general population's mortality in that country. Thus, differences in mortalities of the general populations can influence on the results.

6.8 FUTURE DIRECTIONS

All patients in the study group had psychotic disorder diagnosis and had committed a crime for which they were committed to involuntary forensic psychiatric treatment. Beside these unitive factors there are many disjunctive factors that are important to recognize and to study their effect on the mortality. For example, the possible connection between the offenses committed prior to the forensic psychiatric treatment and mortality is one important topic to be resolved. It is possible that a large proportion of forensic psychiatric patients in Finland have antisocial background in addition to the criminal act for which they were ordered to a forensic psychiatric examination. Thus, the effect in mortality of this antisociality and also secondary diagnoses such as personality disorders should be studied. Also, the influence of different medications used in the treatment is an important topic to be studied. Concerning SUDs' effect in mortality, it would be important to reveal possible differences between different substance disorders.

7 LIMITATIONS

The limitations of the study included a lack of information on the circumstances following the discharge of patients, such as housing arrangements, new hospitalisations and possible prison sentences. There was also no information available on patients' medication during or after treatment or on possible participation in post–discharge outpatient care. These are factors that naturally could have had a great impact on patient mortality. Also, the lack in data of the prior suicide attempts and the crimes committed prior the treatments was a limitation especially in analyzing the suicide mortality.

In the case of patients with SUD, there was no information available on whether they had received any treatment for their SUD in addition to forced abstinence during their forensic psychiatric treatment and whether any possible treatment for the SUD had continued after the end of hospital treatment. In our study, only patients who had a diagnosed SUD or clear evidence of SUD recorded in their forensic psychiatric examination statement were considered as actually having SUD. Some patient records have a mention of substance use but not in a way that would meet the criteria for SUD. As a result of this incomplete background information, some patients with SUD may have been categorised as a non-SUD patient, which would dilute the differences between the groups and the results. Moreover, patients who had no SUD evident during their forensic psychiatric examination may have developed such a disorder later on, which may have led us to underestimate the significance and impact of SUDs on mortality. Also, patients with different degrees of SUDs and an addiction to different kinds of substances were categorised as one group although these differences might have had a significant impact on mortality. There was also a lack in data of possible laboratory tests collected from the patients prior or after death which could have revealed information of substance use. Another point to note is that, since this was a register–based study, the results only indicate correlation and so we can only speculate about causality.

General problems related to register–based studies, such as possible deficiencies and errors in the data, can be considered limitations of this study. The data used in this study was originally produced for other purposes than research, and since this data stretches over a 30-year period, it should be noted that there have been changes to psychiatric diagnostics classification systems during this time. The diagnosis given to patients during their forensic psychiatric examination may have changed during the forensic psychiatric treatment and follow-up and this information was not available to us. Despite changes in psychiatric diagnostics classification systems, the psychotic disorder diagnosis, which is a requirement for involuntary forensic psychiatric treatment, did not change during the treatment and so this key factor in the patient cohort remained the same.

When analysing the results, it should also be noted that the follow-up of patients in the data has been retrospective starting from 1980 and the content of psychiatric treatment has seen many changes over the decades, including the introduction of second-generation antipsychotic medication and, later on, an increase in the use of long-acting injectables, which have potentially affected the mortality observed in the data.

Mortality itself is an unambiguous concept which is not in any way subjective or subject to measurement errors. The SMR results reflect mortality over a longer period and it is possible that the all-cause mortality or mortality in certain cause of death categories was more pronounced at a particular time and less pronounced at a different time and this is not shown in the results.

8 CONCLUSIONS

Mortality in Finnish forensic psychiatric patients is threefold in comparison to the general population, and this excess mortality can be observed in relation to both natural and unnatural deaths. The biggest difference found in the study between forensic psychiatric patients and the general population was the sevenfold suicide mortality in forensic psychiatric patients. The number of suicides, and the fact that over half of the suicides occurred during involuntary hospital treatment, revealed a serious deficiency in identifying the people at risk of suicide and providing a safe environment, leading to a serious treatment failure. Risk factors for suicide should be identified when planning and implementing forensic psychiatric care, and an effort should be made to prevent suicides by applying restrictions appropriate for the situation and by providing a secure hospital environment in a way that alleviates mood swings and anxiety in patients.

The study showed that suicide risk in forensic psychiatric patients remains elevated years after the start and end of treatment. The long-term nature of this risk should be taken into consideration in the prevention of suicides and planning of care. A suicide risk that remains elevated years after the end of treatment can also be an indication of insufficient psychiatric outpatient care in relation to suicide prevention. In patient–centred care, a relationship should be formed with the patient during involuntary treatment that supports the patient in committing themselves to psychiatric treatment even when the involuntary treatment has ended. Identifying suicide risk and active treatment of mood swings combined with a secure doctor-patient relationship which allows the patient to talk about difficult issues would most likely help prevent suicides.

The accident and homicide mortality observed in the study was most pronounced after the end of involuntary forensic psychiatric treatment and it remained prevalent for a long time. It is likely that the underlying factors in these deaths include the loss of the protective hospital environment, risks arising from the disorder and possible lack of coping mechanisms leading, for example, to substance abuse. Psychiatric outpatient care should also take into account the risks for these unnatural deaths and provide patients with sufficient long-term therapeutic support which could reduce these risk factors.

The majority of deaths in forensic psychiatric patients are caused by somatic diseases just like in the general population; in forensic psychiatric patients, however, this cause of death was also more pronounced. In order to address excess mortality due to somatic diseases, it would be important to include advice on a healthy lifestyle as part of psychiatric treatment and to highlight the importance of a healthy diet and exercise. Elevated respiratory disease mortality is possibly linked with the prevalence of tobacco smoking, which is likely to increase mortality due to somatic diseases in general and cardiovascular diseases in particular. Treatments to help patients stop smoking should be actively included in forensic psychiatric treatment and the hospital environment should support efforts to stop smoking. The diagnosis and treatment of somatic diseases must be available during forensic psychiatric treatment and the diagnosis and treatment of these diseases must also be part of psychiatric outpatient care and, where necessary, psychiatric treatment should be integrated as part of the treatment of the somatic disease.

In Finland, it has been proposed that the legislation be amended so that obligatory outpatient care could also be required of forensic psychiatric patients. Such obligatory outpatient care would potentially reduce the mortality observed in the study, especially in the case of unnatural deaths, because patients would be required to commit themselves to long–term outpatient follow-up which could maintain the protective effect associated with hospital care and also prevent risky behaviour such as substance abuse. The planning of such care should take into consideration that, in addition to requiring people to participate in outpatient care, there would also be an obligation to organise adequate outpatient care so that follow-up and monitoring would be accompanied with the psychiatric treatment and support needed by the patient. The study found that suicides committed after discharge occurred during an extended period of time, the median being as late as around 3.5 years from the end of treatment and the median for accidental deaths and homicides as late as seven years after the end of treatment. The study results showed that, in order to prevent these unnatural deaths, obligatory outpatient care would have to be quite long-term so that it could be effective in preventing unnatural deaths over the years.

SUDs reported in forensic psychiatric patients were found to be one very important underlying factor in excess mortality and, in particular, in unnatural deaths. In many of the deaths that occurred after discharge from hospital, especially in the case of unnatural causes, substance use was found to be a contributing factor. The results of this study highlight the importance of identifying and treating SUDs in forensic psychiatric patients. In those forensic psychiatric patients who show evidence of an SUD co-occurring with a psychotic disorder, the treatment of the SUD should be closely integrated with their psychiatric treatment and the continuity of the SUD treatment after the patient is discharged from forensic psychiatric care should be ensured. Patients should already be motivated and encouraged to commit themselves to various SUD treatments during their involuntary hospital treatment so that their participation in treatment is natural and more likely after their involuntary treatment has ended. For psychotic disorder patients with comorbid SUDs, it would be essential to offer psychoeducation and integrate psychosocial treatments as part of the SUD treatment. Models that are designed to motivate the patient and allow the patient to practise coping skills should be part of the basics in SUD treatment. The use of possible drug therapies, psychotherapy and peer support should be part of any individual and patient-centred treatment that supports recovery orientation.

Excess mortality observed in forensic psychiatric patients shows why the support and treatment of these patients is so important both during and after the end of their forensic psychiatric treatment. After all, a civilization is measured by how it treats its weakest members.

REFERENCES

Arendt, M., Munk-Jørgensen, P., Sher, L. & Jensen, S.O. 2011. Mortality among individuals with cannabis, cocaine, amphetamine, MDMA, and opioid use disorders: a nationwide follow-up study of Danish substance users in treatment. Drug Alcohol Depend. 114: 134–9.

Batki, S.L., Meszaros, Z.S, Strutynski, K., Dimmock, J.A., Leontieva, L., Ploutz-Snyder, R., Canfield, K. & Drayer, R.A. 2009. Medical comorbidity in patients with schizophrenia and alcohol dependence. Schizophr Res. 107: 139–46.

Björkenstam, E., Ljung, R., Burström, B., Mittendorfer-Rutz, E., Hallqvist, J. & Weitoft, G.R. 2012. Quality of medical care and excess mortality in psychiatric patients - a nationwide register–based study in Sweden. BMJ Open. 2: e000778.

Bogdanowicz, K.M., Stewart, R., Broadbent, M., Hatch, S.L., Hotopf, M., Strang, J. & Hayes, R.D. 2015. Double trouble: Psychiatric comorbidity and opioid addiction-all-cause and cause-specific mortality. Drug Alcohol Depend. 148: 85–92.

Briskman, I., Bar, G., Boaz, M. & Shargorodsky, M. 2012. Impact of co-morbid mental illness on the diagnosis and management of patients hospitalized for medical conditions in a general hospital. Int J Psychiatry Med. 43: 339–48.

Brown, S. 1997. Excess mortality of schizophrenia. A meta-analysis. Br J Psychiatry. 171: 502–8.

Brown, S., Kim, M., Mitchell, C. & Inskip, H. 2010. Twenty-five year mortality of a community cohort with schizophrenia. Br J Psychiatry. 196: 116–21.

Bushe, C.J., Bradley, A.J., Wildgust, H.J. & Hodgson, R.E. 2009. Schizophrenia and breast cancer incidence: a systematic review of clinical studies. Schizophr Res. 114: 6–16.

Bushe, C.J., Taylor, M. & Haukka, J. 2010. Mortality in schizophrenia: a measurable clinical endpoint. Review. J Psychopharmacol. 24: S17–25.

Catts, V.S., Catts, S.V., O'Toole, B.I. & Frost, A.D. 2008. Cancer incidence in patients with schizophrenia and their first-degree relatives - a meta-analysis. Acta Psychiatr Scand. 117: 323–36.

Chang, C.K., Hayes, R.D., Broadbent, M., Fernandes, A.C., Lee, W., Hotopf, M. & Stewart, R. 2010. All-cause mortality among people with serious mental illness (SMI), substance use disorders, and depressive disorders in southeast London: a cohort study. BMC Psychiatry. 10: 77.

Chesney, E., Goodwin, G.M. & Fazel, S. 2014. Risks of all-cause and suicide mortality in mental disorders: a meta-review. World Psychiatry. 13: 153–60.

Clarke, M., Davies, S., Hollin, C. & Duggan, C. 2011. Long-term suicide risk in forensic psychiatric patients. Arch Suicide Res. 15: 16–28.

Clemmensen, L., Vernal, D.L. & Steinhausen, H.C. 2012. A systematic review of the long-term outcome of early onset schizophrenia. BMC Psychiatry. 12: 150.

Criminal Code of Finland. Available at https://www.finlex.fi/fi/laki/ajantasa/1889/18890039001. Retrieved 23 Jan 2020.

Crump, C., Sundquist, K., Winkleby, M.A. & Sundquist, J. 2013. Mental disorders and risk of accidental death. Br J Psychiatry. 203: 297–302.
Curtin, L.R. & Klein, R.J. 1995. Direct standardization (age-adjusted death rates). Healthy People 2000 Stat Notes. (6): 1–10.
Daumit, G.L., Goldberg, R.W., Anthony, C., Dickerson, F., Brown, C.H., Kreyenbuhl, J., Wohlheiter, K. & Dixon, L.B. 2005. Physical activity patterns in adults with severe mental illness. J Nerv Ment Dis. 193: 641–6.
Davies, S., Clarke, M., Hollin, C. & Duggan, C. 2007. Long-term outcomes after discharge from medium secure care: a cause for concern. Br J Psychiatry. 191: 70–4.
Dickens, G., Stubbs, J., Popham, R. & Haw, C. 2005. Smoking in a forensic psychiatric service: a survey of inpatients' views. J Psychiatr Ment Health Nurs. 12: 672–8.
Dickey, B., Normand, S.L., Weiss, R.D., Drake, R.E. & Azeni H. 2002. Medical morbidity, mental illness, and substance use disorders. Psychiatr Serv. 53: 861–7.
Dutta, R., Murray, R.M., Allardyce, J., Jones, P.B. & Boydell, J.E. 2012. Mortality in first-contact psychosis patients in the UK: a cohort study. Psychol Med. 42: 1649–61.
Esse, K., Fossati-Bellani, M., Traylor, A. & Martin-Schild, S. 2011. Epidemic of illicit drug use, mechanisms of action/addiction and stroke as a health hazard. Brain Behav. 1: 44–54.
Fazel, S., Wolf, A., Fimińska, Z. & Larsson, H. 2016. Mortality, rehospitalisation and violent crime in forensic psychiatric patients discharged from hospital: rates and risk factors. PLoS One. 11: e0155906.
Fazel, S., Fimińska, Z., Cocks, C. & Coid J. 2016. Patient outcomes following discharge from secure psychiatric hospitals: systematic review and meta-analysis. Br J Psychiatry. 208: 17–25.
Finnish Code of Judicial Procedure. Available at https://finlex.fi/fi/laki/ajantasa/1734/17340004. Retrieved 23 Jan 2020.
Finnish Mental Health Act. Available at https://www.finlex.fi/fi/laki/ajantasa/1990/19901116. Retrieved 23 Jan 2020.
Gallaghan, R.C., Gatley, J.M., Sykes, J. & Taylor, L. 2018. The prominence of smoking-related mortality among individuals with alcohol- or drug-use disorders. Drug Alcohol Rev. 37: 97–105.
Harris, E.C. & Barraclough, B. 1998. Excess mortality of mental disorder. Br J Psychiatry 173: 11–53.
Hawton, K., Sutton, L., Haw, C., Sinclair, J. & Deeks, J.J. 2005. Schizophrenia and suicide: systematic review of risk factors. Br J Psychiatry 187: 9–20.
Hehir, A.M., Indig, D., Prosser, S. & Archer, V.A. 2012. Evaluation of a smoke-free forensic hospital: patients' perspectives on issues and benefits. Drug Alcohol Rev. 31: 672–7.
Heiberg, I.H., Jacobsen, B.K., Nesvåg, R., Bramness, J.G., Reichborn-Kjennerud, T., Næss, Ø., Ystrom, E., Hultman, C.M. & Høye, A. 2018. Total and cause-specific standardized mortality ratios in patients with schizophrenia and/or substance use disorder. PLoS One. 13: e0202028.
Heilä, H., Haukka, J., Suvisaari, J. & Lönnqvist, J. 2005. Mortality among patients with schizophrenia and reduced psychiatric hospital care. Psychol Med. 35: 725–32.

Hellemose, L.A.A., Laursen, T.M., Larsen, J.T. & Toender, A. 2018. Accidental deaths among persons with schizophrenia: A nationwide population-based cohort study. Schizophr Res. 199: 149–153.

Hennekens, C.H., Hennekens, A.R., Hollar, D. & Casey, D.E. 2005. Schizophrenia and increased risks of cardiovascular disease. Review. Am Heart J. 150: 1115–21.

De Hert, M., McKenzie, K. & Peuskens, J. 2001. Risk factors for suicide in young people suffering from schizophrenia: a long-term follow-up study. Schizophr Res. 47: 127–34.

Hiroeh, U., Appleby, L., Mortensen, P.B. & Dunn, G. 2001. Death by homicide, suicide, and other unnatural causes in people with mental illness: a population–based study. Lancet 358: 2110–2.

Hjorthøj, C., Østergaard, M.L., Benros, M.E., Toftdahl, N.G., Erlangsen, A., Andersen, J.T. & Nordentoft, M. 2015. Association between alcohol and substance use disorders and all-cause and cause-specific mortality in schizophrenia, bipolar disorder, and unipolar depression: a nationwide, prospective, register-based study. Lancet Psychiatry 2: 801–8.

Hor, K. & Taylor, M. 2010. Suicide and schizophrenia: a systematic review of rates and risk factors. J Psychopharmacol. 24: S81–90.

Høye, A., Jacobsen, B.K. & Hansen, V. 2011. Increasing mortality in schizophrenia: are women at particular risk? A follow-up of 1111 patients admitted during 1980–2006 in Northern Norway. Schizophr Res. 132: 228–32.

Hunt, G.E., Large, M.M., Cleary, M., Lai, H.M.X. & Saunders, J.B. 2018. Prevalence of comorbid substance use in schizophrenia spectrum disorders in community and clinical settings, 1990–2017: Systematic review and meta-analysis. Drug Alcohol Depend. 191: 234–258.

Jones, R.M., Hales, H., Butwell, M., Ferriter, M. & Taylor, P.J. 2011. Suicide in high security hospital patients. Soc Psychiatry Psychiatr Epidemiol. 46: 723–31.

Joukamaa, M., Heliövaara, M., Knekt, P., Aromaa, A., Raitasalo, R. & Lehtinen V. 2001. Mental disorders and cause-specific mortality. Br J Psychiatry 179: 498–502.

Khan, A., Faucett, J., Morrison, S. & Brown, W.A. 2013. Comparative mortality risk in adult patients with schizophrenia, depression, bipolar disorder, anxiety disorders, and attention-deficit/hyperactivity disorder participating in psychopharmacology clinical trials. JAMA Psychiatry 70: 1091–9.

Kiviniemi, M., Suvisaari, J., Pirkola, S., Häkkinen, U., Isohanni, M. & Hakko, H. 2010. Regional differences in five-year mortality after a first episode of schizophrenia in Finland. Psychiatr Serv. 61: 272–9.

Kiviniemi, M., Suvisaari, J., Koivumaa-Honkanen, H., Häkkinen, U., Isohanni, M. & Hakko, H. 2013. Antipsychotics and mortality in first-onset schizophrenia: prospective Finnish register study with 5-year follow-up. Schizophr Res. 150: 274–80.

Koola, M.M., McMahon, R.P., Wehring, H.J., Liu, F., Mackowick, K.M., Warren, K.R., Feldman, S., Shim, J.C., Love, R.C. & Kelly, D.L. 2012. Alcohol and cannabis use and mortality in people with schizophrenia and related psychotic disorders. J Psychiatr Res. 46: 987–93.

Kuo, C.J., Tsai, S.Y., Lo, C.H., Wang, Y.P. & Chen, C.C. 2005. Risk factors for completed suicide in schizophrenia. J Clin Psychiatry. 66: 579–85.
Lahti, M., Tiihonen, J., Wildgust, H., Beary, M., Hodgson, R., Kajantie, E., Osmond, C., Räikkönen, K. & Eriksson, J. 2012. Cardiovascular morbidity, mortality and pharmacotherapy in patients with schizophrenia. Psychol Med. 42: 2275–85.
Lahti, R.A & Penttilä A. 2001. The validity of death certificates: routine validation of death certification and its effects on mortality statistics. Forensic Sci Int. 1:15-32.
Laursen, T.M., Munk-Olsen, T. & Gasse, C. 2011. Chronic somatic comorbidity and excess mortality due to natural causes in persons with schizophrenia or bipolar affective disorder. PLoS One. 6: e24597.
Laursen, T.M., Munk-Olsen, T. & Vestergaard, M. 2012. Life expectancy and cardiovascular mortality in persons with schizophrenia. Review. Curr Opin Psychiatry. 25: 83–8.
Laursen, T.M., Wahlbeck, K., Hällgren, J., Westman, J., Ösby, U., Alinaghizadeh, H., Gissler, M. & Nordentoft, M. 2013. Life expectancy and death by diseases of the circulatory system in patients with bipolar disorder or schizophrenia in the Nordic countries. PLoS One. 8: e67133.
Laursen, T.M., Nordentoft, M. & Mortensen, P.B. 2014. Excess early mortality in schizophrenia. Review. Annu Rev Clin Psychol. 10: 425–48.
Laursen, T.M., Mortensen, P.B., MacCabe, J.H., Cohen, D. & Gasse, C. 2014. Cardiovascular drug use and mortality in patients with schizophrenia or bipolar disorder: a Danish population-based study. Psychol Med. 44: 1625–37.
de Leon, J. & Diaz, F.J. 2005. A meta-analysis of worldwide studies demonstrates an association between schizophrenia and tobacco smoking behaviors. Schizophr Res. 76: 135–57.
Lumme, S., Pirkola, S., Manderbacka, K. & Keskimäki, I. 2016. Excess mortality in patients with severe mental disorders in 1996-2010 in Finland. PLoS One. 11: e0152223.
Mathers, B.M., Degenhardt, L., Bucello, C., Lemon, J., Wiessing, L. & Hickman M. 2013. Mortality among people who inject drugs: a systematic review and meta-analysis. Bull World Health Organ. 91: 102–23.
McCreadie, R.G. & Scottish Schizophrenia Lifestyle Group. 2003. Diet, smoking and cardiovascular risk in people with schizophrenia: descriptive study. Br J Psychiatry. 183: 534–9.
McGrath, J., Saha, S., Chant, D. & Welham, J. 2008. Schizophrenia: a concise overview of incidence, prevalence, and mortality. Epidemiol Rev. 30: 67–76.
Meehan, J., Kapur, N., Hunt, I. M., Turnbull, P., Robinson, J., Bickley, H., Parsons, R., Flynn, S., Burns, J., Amos, T., Shaw, J. & Appleby, L. 2006. Suicide in mental health inpatients and within 3 months of discharge. National clinical survey. Br J Psychiatry. 188: 129–134.
Mitchell, A.J. & Malone D. 2006. Physical health and schizophrenia. Review. Curr Opin Psychiatry. 19: 432–7.
Mitchell, A.J. & Lord, O. 2010. Do deficits in cardiac care influence high mortality rates in schizophrenia? A systematic review and pooled analysis. J Psychopharmacol. 24: S69–80.

Mortensen, P.B., Agerbo, E., Erikson, T., Qin, P. & Westergaard-Nielsen, N. 2000. Psychiatric illness and risk factors for suicide in Denmark. Lancet 355: 9–12.
Naing, N.N. 2000. Easy Way to Learn Standardization: Direct and Indirect Methods. Malays J Med Sci. 7: 10–15.
Nicholas, L.M. & Golden RN. 2001. Managing the suicidal patient. Clin Cornerstone 3: 47–57.
Nordentoft, M., Mortensen, P.B. & Pedersen, C.B. 2011. Absolute risk of suicide after first hospital contact in mental disorder. Arch Gen Psychiatry. 68: 1058–64.
Nordentoft, M., Wahlbeck, K., Hällgren, J., Westman, J., Osby, U., Alinaghizadeh, H., Gissler, M. & Laursen, T.M. 2013. Excess mortality, causes of death and life expectancy in 270,770 patients with recent onset of mental disorders in Denmark, Finland and Sweden. PLoS One. 8: e55176.
Nyhlén, A., Fridell, M., Hesse, M. & Krantz, P. 2011a. Causes of premature mortality in Swedish drug abusers: a prospective longitudinal study 1970–2006. J Forensic Leg Med. 18: 66–72.
Nyhlén, A., Fridell, M., Bäckström, M., Hesse, M. & Krantz, P. 2011b. Substance abuse and psychiatric co–morbidity as predictors of premature mortality in Swedish drug abusers a prospective longitudinal study 1970–2006. BMC Psychiatry 11: 122.
Official Statistics of Finland (OSF): Causes of death [e-publication]. ISSN=1799–5078. 2011, Appendix table 1a. Deaths by underlying cause of death (54-group classification) and by age in 2011, both sexes. Helsinki: Statistics Finland. Available at http://www.stat.fi/til/ksyyt/2011/ksyyt_2011_2012–12–21_tau_001_en.html. Retrieved 10 Jul 2017.
Official Statistics of Finland (OSF): Causes of death [e-publication]. ISSN=1799–5078. 2018, 1. Causes of death in 2018. Helsinki: Statistics Finland. Available at http://www.stat.fi/til/ksyyt/2018/ksyyt_2018_2019–12–16_kat_001_en.html. Retrieved 8 Jan.2020.
Olfson, M., Gerhard, T., Huang, C., Crystal, S. & Stroup, T.S. 2015. Premature mortality among adults with schizophrenia in the United States. JAMA Psychiatry. 72: 1172–81.
Osby, U., Correia, N., Brandt, L., Ekbom, A. & Sparén, P. 2000. Mortality and causes of death in schizophrenia in Stockholm county, Sweden. Schizophr Res. 45: 21–8.
Palmer, B.A., Pankratz, V.S. & Bostwick, J.M. 2005. The lifetime risk of suicide in schizophrenia: a re-examination. Arch Gen Psychiatry. 62: 247–53.
Pirkola, S., Sund, R., Sailas, E. & Wahlbeck, K. 2009. Community mental-health services and suicide rate in Finland: A nationwide small-area analysis. Lancet. 373: 147–53.
Pompili, M., Mancinelli, I., Ruberto, A., Kotzalidis, G.D., Girardi, P. & Tatarelli, R. 2005. Where schizophrenic patients commit suicide: A review of suicide among inpatients and former inpatients. Int J Psychiatry Med. 35: 171–90
Qin, P. & Nordentoft, M. 2005. Suicide risk in relation to psychiatric hospitalization: evidence based on longitudinal registers. Arch Gen Psychiatry. 62: 427–32.
Rantanen, H., Koivisto, A.M., Salokangas, R.K., Helminen, M., Oja, H., Pirkola, S., Wahlbeck, K. & Joukamaa, M. 2009. Five-year mortality of Finnish schizophrenia patients in the era of deinstitutionalization. Soc Psychiatry Psychiatr Epidemiol. 44: 135–42.

Reutfors, J., Brandt, L., Jönsson, E.G., Ekbom, A., Sparén, P. & Osby, U. 2009. Risk factors for suicide in schizophrenia: findings from a Swedish population-based case-control study. Schizophr Res. 108: 231–7.

Rosen, C.S., Kuhn, E., Greenbaum, M.A. & Drescher, K.D. 2008. Substance abuse-related mortality among middle-aged male VA psychiatric patients. Psychiatr Serv. 59: 290–6.

Saha, S., Chant, D. & McGrath, J. 2007. A systematic review of mortality in schizophrenia: is the differential mortality gap worsening over time? Arch Gen Psychiatry. 64: 1123–31.

Sakinofsky, I. 2014. Preventing suicide among inpatients. Can J Psychiatry. 59: 131–40.

Salize, H. & Dreßing, H. 2005. Placement and treatment of mentally disordered offenders. Legislation and practice in EU member states. University of Mannhein, Mannheim, Germany.

Schmidt, L.M., Hesse, M. & Lykke, J. 2011. The impact of substance use disorders on the course of schizophrenia - a 15-year follow-up study: dual diagnosis over 15 years. Schizophr Res. 130: 228–33.

Sher, L. & Kahn, R.S. 2019. Suicide in schizophrenia: An educational overview. Review. Medicina (Kaunas). 55(7).

Statistics Act 280/2004. Available at http://www.stat.fi/meta/lait/statistics–act–2802004_en.html. Retrieved 22 Aug 2020.

Statistics Finland, online service. Available at http://www.stat.fi/index_en.html. Retrieved 14. Jun 2020.

Steingrímsson, S., Sigurdsson, M.I., Aspelund, T., Sigfússon, S. & Magnússon, A. 2016. Total population-based study of the impact of substance use disorders on the overall survival of psychiatric inpatients. Nord J Psychiatry. 70: 161–6.

Suokas, J.T., Perälä, J., Suominen, K., Saarni, S., Lönnqvist, J. & Suvisaari, J.M. 2010. Epidemiology of suicide attempts among persons with psychotic disorder in the general population. Schizophr Res. 124: 22–8.

Tabita, B., de Santi, M.G. & Kjellin, L. 2012. Criminal recidivism and mortality among patients discharged from a forensic medium secure hospital. Nord J Psychiatry. 66: 283–9.

Taipale, H., Tanskanen, A., Mehtälä, J., Vattulainen, P., Correll, CU. & Tiihonen J. 2020. 20-year follow-up study of physical morbidity and mortality in relationship to antipsychotic treatment in a nationwide cohort of 62,250 patients with schizophrenia (FIN20). World Psychiatry. 19: 61–68.

Takeda, K., Sugawara, N., Matsuda, T., Shimada, A., Nagata, T., Kashiwagi, H., Hirabayashi, N. & Okada, T. 2019. Mortality and suicide rates in patients discharged from forensic psychiatric wards in Japan. Compr Psychiatry. 95: 152131.

Tanskanen, A., Tiihonen, J. & Taipale, H. 2018. Mortality in schizophrenia: 30-year nationwide follow-up study. Acta Psychiatr Scand. 138: 492–499.

THL online service. Terveyden ja hyvinvoinnin laitos, oikeuspsykiatria. Available at https://thl.fi/fi/web/mielenterveys/mielenterveyspalvelut/oikeuspsykiatria. Retrieved 6 Jun 2020.

Tiihonen, J., Wahlbeck, K., Lönnqvist, J., Klaukka, T., Ioannidis, J.P., Volavka, J. & Haukka, J. 2006. Effectiveness of antipsychotic treatments in a nationwide cohort of patients in community care after first hospitalisation due to schizophrenia and schizoaffective disorder: observational follow-up study. BMJ. 333: 224.

Tiihonen, J., Lönnqvist, J., Wahlbeck, K., Klaukka, T., Niskanen, L., Tanskanen, A. & Haukka, J. 2009. 11-year follow-up of mortality in patients with schizophrenia: a population-based cohort study (FIN11 study). Lancet. 374: 620–7.

Uhrskov Sørensen, L., Bengtson, S., Lund, J., Ibsen, M. & Långström, N. 2020. Mortality among male forensic and non-forensic psychiatric patients: matched cohort study of rates, predictors and causes-of-death. Nord J Psychiatry. 4: 1–8.

Vermeulen, J.M., van Rooijen, G., van de Kerkhof, M.P.J., Sutterland, A.L., Correll, C.U. & de Haan, L. 2019. Clozapine and long-term mortality risk in patients with schizophrenia: A systematic review and meta-analysis of studies lasting 1.1–12.5 years. Schizophr Bull. 45: 315–329.

Walker, E.R., McGee, R.E. & Druss, B.G. 2015. Mortality in mental disorders and global disease burden implications: a systematic review and meta-analysis. JAMA Psychiatry 72: 334–41.

Zlodre, J. & Fazel, S. 2012. All-cause and external mortality in released prisoners: systematic review and meta-analysis. Am J Public Health. 102: e67–75.

ORIGINAL PUBLICATIONS (I – III)

I

Mortality among forensic psychiatric patients in Finland

Ojansuu I, Putkonen H and Tiihonen J

Nord J Psychiatry 69: 25–27, 2015

informa
healthcare

Mortality among forensic psychiatric patients in Finland

ILKKA OJANSUU, HANNA PUTKONEN, JARI TIIHONEN

Ojansuu I, Putkonen H, Tiihonen J. Mortality among forensic psychiatric patients in Finland. Nord J Psychiatry 2015;69:25–27.

Background: Both mental illness and criminality are associated with higher risk of early death, yet the mortality among forensic psychiatric patients who are affected by both mental illness and criminal behaviour has scarcely been studied. *Aims:* To analyse the mortality among all patients who were committed to a compulsory forensic psychiatric hospital treatment in Finland between 1980 and 2009. Mortality was analysed according to the age when the patient was committed to forensic treatment. *Results:* A total of 1253 patients were included, of which 153 were females and 1100 were males. The mean follow-up time in this study was 15.1 years, and 351 (28%) had died during the follow-up period. The standardized mortality rate (SMR) for the whole study group was 2.97 (95% CI 2.67–3.29). Among females the SMR was 3.62 (95% CI 2.57–5.09), and among males 2.91 (95% CI 2.61–3.25). The SMRs were higher when patients were committed to forensic treatment before the age of 40 years. *Conclusion:* This study showed an increased mortality among forensic psychiatric patients compared with the general population and the mortality was inversely proportional to the age when the treatment had begun. In contrast to the earlier studies, the mortality in this study was lower indicating that prolonged treatment may have an overall protective effect on forensic psychiatric patients.

• *Compulsory treatment, Forensic psychiatry, Mortality.*

Ilkka Ojansuu, M.D., Niuvankuja 65, 70240 Kuopio, Finland, E-mail: ilkka.ojansuu@niuva.fi;
Accepted 24 March 2014.

Mortality among psychiatric patients is known to be higher than the general population (1), and patients who are admitted to hospital for a mental disorder in Denmark, Finland and Sweden have a two- to threefold higher mortality than the general population (2). Finnish patients with schizophrenia between the ages of 20 and 40 had 17.0–22.5 years less life expectancy when compared with the general population (3). Discharged adult prisoners have a 5–10 times higher mortality when compared with an age-matched population in Finland, and in 2002, the mean age of death was 45 years for those with a prior criminal act (4).

Only a few scientific articles have been published on the mortality of the forensic patients who are affected by both mental illness and criminal behaviour, both of which appear to be associated with a higher risk of early death. In Sweden, 400 subjects aged 15–29 years were found to be mentally abnormal in a forensic psychiatric examination conducted between 1951 and 1954, and subsequently followed for approximately 20 years (5). Forty-three of those subjects had died during the study period, which was three times the expected mortality in the average population. One hundred subjects in that study had been designated "insane" and 11 of them had died during the study period, which was four times the expected mortality when compared with the average population. In another Swedish study, 46 subjects who had been in forensic treatment because of serious mental disorder were followed after their discharge during a study period of 1992–1999 (6). The median follow-up time was 53 months (range 0–93 months) and five subjects died during the follow-up, which gave a standardized mortality rate (SMR) of 13.4 (95% CI 4.35–31.3). Subjects from that study were also involved in another study of 88 forensic patients that were discharged in Sweden during 1992–2007 (7). These subjects were followed until the end of 2008, and 20 died during the follow-up time, which gave a SMR of 10.4 (95% CI 6.4–16.1). The SMR for males was 9.2 (95% CI 5.3–14.8; 17 deaths), and for females 40.5 (95% CI 8.3–118.3; three deaths).

Aims

Earlier research into forensic patients' mortality primarily suffers from antiquity as well as small sample sizes and subsequently large confidence intervals. Therefore, it

DOI: 10.3109/08039488.2014.908949

remains unclear how the mortality rate of forensic psychiatric patients compares with general population. The purpose of this study was to analyse the mortality among all patients who had been committed to compulsory forensic psychiatric hospital treatment in Finland during 1980–2009. In addition, the mortality of these patients was analysed by different age groups, according to the age when the patient was committed to forensic treatment.

Material and methods

In Finland, a court determines whether a forensic examination is necessary to assess the criminal responsibility of a defendant. If the defendant is determined in forensic examination to have a serious mental disorder then he/she can be exempted from legal punishment and be committed to compulsory forensic hospital treatment. This study consists of the patients that have been committed to compulsory forensic hospital treatment in Finland during 1980–2009.

Material for this study was obtained from the National Institute for Health and Welfare's archive. This archive is a national collection of all Finnish forensic psychiatric reports and the information of patients who have been committed to forensic psychiatric treatment. It is a nationwide and comprehensive archive and the National Institute for Health and Welfare has maintained its accuracy and completeness in a constant manner throughout the years of data collection. In Finland, during 1980–2009, 1253 patients were committed to forensic hospital treatment; 153 (12.2%) of these were female and 1100 (87.8%) were male. The mean age (± standard deviation) at the time of the forensic examination was (37 ± 13.5 years; range 15–82 years). The mean follow-up time in this study was (15.1 ± 8.4 years; range 0.02–31.94 years), and the follow-up ended on 31 December 2011 or when the patient had died. For those male patients whose treatment had ended during the study's follow-up time ($n = 795$) the median treatment duration had been 4.5 years, and for female patients ($n = 119$) 3.9 years.

To establish mortality in the study group, patients were linked to the national death register of the Statistics Finland, which includes all deaths in Finland. Statistics Finland's activity is maintained in a consistent manner and based on the Statistics Finland Act. SMR was calculated by dividing the observed number of deaths in the study group by the expected number of deaths according to age and gender in the standard population.

This study was approved by Finland's National Institute for Health and Welfare and by Statistics Finland.

Results

The study group consisted of 1253 patients, and 351 (28%) had died during the follow-up period. The SMR for the whole study group was 2.97 (95% CI 2.67–3.29). By gender, 318 (90.6%) of the deceased were male, with a SMR of 2.91 (95% CI 2.61–3.25) and 33 (9.4%) of the deceased were female with a SMR of 3.62 (95% CI 2.57–5.09).

Table 1. Standardized mortality rates (SMRs) by different age groups according to the age when patients were committed to forensic treatment.

Age group	*n*	Observed deaths	Expected deaths	SMR	95% CI
<30	433	70	14.52	4.82	3.81–6.09
30–39	373	87	23.46	3.71	3.01–4.58
40–49	238	72	27.98	2.57	2.04–3.24
50–59	103	47	20.66	2.28	1.71–3.03
>60	106	75	31.76	2.36	1.88–2.96

The mortality was also analysed by different age groups, according to the age when patients had been committed to forensic treatment. The SMRs were higher when patients under the age of 40 had been committed to forensic treatment. The SMRs for different age groups are presented in Table 1.

Conclusion

These results show an increased mortality among forensic psychiatric patients. The elevated mortality identified in this study is in line with previous reports from Sweden, although the results presented here are not as excessive.

The difference in results may be primarily due to differences in study design, i.e. sample size and follow-up times. Variations may also be due to differences in the legal system and forensic treatment between Finland and Sweden. In Finland, for example, a person can be committed to a forensic hospital treatment only if he/she is determined to be psychotic, which is not mandatory in Sweden.

The differences in treatment duration may also have an effect on results. The median treatment duration was 2.5 years for males and 4.2 years for females among patients who were discharged from a Swedish forensic psychiatric hospital during 1992–2007 (6, 7). In the present study, the median treatment duration was 4.5 years (males) and 3.9 years (females) for those patients whose treatment had ended during the study's follow-up time. While the vast majority of forensic patients are males, this could indicate that prolonged treatment has a protective effect on patients. Longer treatment period among male patients could also explain the difference in mortality among genders in our study. More studies are required to uncover this relation between the treatment duration and the mortality of the forensic psychiatric patients.

This study also showed mortality to be inversely proportional to the age at which compulsory forensic

treatment began. A more normal life expectancy could be expected for those who had been treated from a younger age, but that was not seen in the present study. The elevated mortality in the younger age groups could result from an earlier onset and more challenging symptoms of the psychiatric syndrome for these patients. This is true, for example in schizophrenia, in which early onset has been shown to correspond with the severity of the course of illness (8). This calls for further studies among forensic patients.

Acknowledgement

The study was supported by annual EVO financing (special government subsidies) for the Niuvanniemi Hospital, Finland. The funder was not involved in the conduct of the study or in the collection, management, analysis or interpretation of the data. We thank Hannu Kautiainen (Medcare Oy) for his work with statistical analyses and both Aija Räsänen and Marianne Soukkanen for secretarial assistance.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

1. Harris EC, Barraclough B. Excess mortality of mental disorder. Br J Psychiatry 1998;173:11–53.
2. Wahlbeck K, Westman J, Nordentoft M, Gissler M, Laursen TM. Outcomes of Nordic mental health systems: Life expectancy of patients with mental disorders. Br J Psychiatry 2011;199:453–8.
3. Tiihonen J, Lönnqvist J, Wahlbeck K, Klaukka T, Niskanen L, Tanskanen A, et al. 11-year follow-up of mortality in patients with schizophrenia: A population-based cohort study (FIN11 study). Lancet 2009;374:620–7.
4. Hypén K. Vankilasta vuosina 1993–2001 vapautuneet ja vankilaan uudestaan palanneet. Rikosseuraamusviraston julkaisuja 1/2004.
5. Reiter K. Mortality and causes of death in men found to be mentally abnormal by forensic psychiatrists. Scand J Soc Med 1974;2:1–3.
6. Björk T, Lindqvist P. Mortality among mentally disordered offenders: A community based follow-up study. Crim Behav Ment Health 2005;15:93–6.
7. Tabita B, de Santi MG, Kjellin L. Criminal recidivism and mortality among patients discharged from a forensic medium secure hospital. Nord J Psychiatry 2012;66:283–9.
8. Clemmensen L, Vernal DL, Steinhausen HC. A systematic review of the long-term outcome of early onset schizophrenia. BMC Psychiatry 2012;12:150.

Ilkka Ojansuu, M.D., Niuvanniemi Hospital, Kuopio, Finland.
Hanna Putkonen, M.D., Ph.D., associate professor, Kellokoski Hospital, Hospital District of Helsinki and Uusimaa, Finland.
Jari Tiihonen, M.D., Ph.D., professor, Karolinska Institutet, Department of Clinical Neuroscience, Stockholm, Sweden; University of Eastern Finland, Department of Forensic Psychiatry, Niuvanniemi Hospital, Kuopio, Finland; National Institute for Health and Welfare, Helsinki, Finland.

II

Cause–specific mortality in Finnish forensic psychiatric patients

Ojansuu I, Putkonen H and Tiihonen J

Nord J Psychiatry 72: 374–379, 2018

Taylor & Francis
Taylor & Francis Group

Nordic Journal of Psychiatry

ISSN: 0803-9488 (Print) 1502-4725 (Online) Journal homepage: http://www.tandfonline.com/loi/ipsc20

Cause-specific mortality in Finnish forensic psychiatric patients

Ilkka Ojansuu, Hanna Putkonen & Jari Tiihonen

To cite this article: Ilkka Ojansuu, Hanna Putkonen & Jari Tiihonen (2018) Cause-specific mortality in Finnish forensic psychiatric patients, Nordic Journal of Psychiatry, 72:5, 374-379, DOI: 10.1080/08039488.2018.1467965

To link to this article: https://doi.org/10.1080/08039488.2018.1467965

NORDIC JOURNAL OF PSYCHIATRY
2018, VOL. 72, NO. 5, 374–379
https://doi.org/10.1080/08039488.2018.1467965

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Cause-specific mortality in Finnish forensic psychiatric patients

Ilkka Ojansuu[a,b], Hanna Putkonen[c,d] and Jari Tiihonen[d,e,f]

[a]Kuopio University Hospital, Kuopio, Finland; [b]Niuvanniemi Hospital, Kuopio, Finland; [c]Vanha Vaasa Hospital, Vaasa, Finland; [d]Helsinki University Hospital, Department of Psychiatry, Helsinki, Finland; [e]Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden; [f]Department of Forensic Psychiatry, Niuvanniemi Hospital, University of Eastern Finland, Kuopio, Finland

ABSTRACT

Purpose: To analyze the causes of mortality among patients committed to compulsory forensic psychiatric hospital treatment in Finland during 1980–2009 by categorizing the causes of mortality into somatic diseases, suicides and other unnatural deaths.

Materials and methods: The causes of mortality were analyzed among 351 patients who died during the follow-up. Standardized mortality ratio (SMR) was calculated as the ratio of observed and expected number of deaths by using the subject-years methods with 95% confidence intervals, assuming a Poisson distribution. The expected number of deaths was calculated on the basis of sex-, age- and calendar-period-specific mortality rates for the Finnish population.

Results: The vast majority (249/351) of deaths were due to a somatic disease with SMR of 2.6 (mean age at death 61 years). Fifty nine patients committed suicide with a SMR of 7.1 (mean age at death 40 years). Four patients were homicide victims (mean age at death 40 years) and 32 deaths were accidental (mean age at death 52 years). The combined homicides and accidental deaths resulted in a SMR of 1.7.

Conclusions: The results of this study point out that the high risk for suicide should receive attention when the hospital treatment and the outpatient care is being organized for forensic psychiatric patients. In addition, the risk of accidents should be evaluated and it should be assured that the patients receive proper somatic healthcare during the forensic psychiatric treatment and that it continues also in the outpatient setting.

ARTICLE HISTORY
Received 17 July 2017
Revised 9 November 2017
Accepted 14 April 2018

KEYWORDS
Mortality; forensic psychiatry; suicide

Background

It is known that all types of mental disorders increase the risk of premature death [1]. In a 17-year follow-up study of the Finnish general population, it was shown that suffering from any mental disorder was associated with a significant risk of premature death, with a relative risk of 1.6 for men and 1.4 for women [2]. The excess mortality was due to cardiovascular diseases, respiratory diseases and suicides in both genders and in men also due to nonsuicidal injuries. A psychiatric case register study conducted in Finland, Denmark and Sweden monitored recent onset patients with a psychiatric disorder admitted to psychiatric hospital treatment [3]. The study group included 7953 Finnish schizophrenia spectrum patients, 834 of whom died during the study period resulting in an overall Standardized Mortality Ratio (SMR) of 2.9. The SMR for deaths due to diseases was 2.6, for suicides it was much higher, 12.5, and for other external causes it was found to be 3.0.

We detected increased mortality among forensic psychiatric patients in Finland in our previous study, with an SMR 3.0 when compared to the general population [4], but cause-specific mortality among forensic psychiatric patients has been rarely evaluated. In a study that consisted of 595 patients admitted in a medium secure unit in England, the overall SMR was 6.0 [5]. The SMR for deaths due to diseases was 3.1, for suicides 32.3 and for other external causes 19.0. In another English study examining 5955 patients admitted to high security hospitals, the SMR for suicides among male patients was 6.6 and for female patients 40.1 during their hospital treatment [6]. After discharge from the hospitals, the SMR for suicides among male patients was 23.3 and among female patients 44.9. In a Swedish study consisting of 88 patients who were discharged from a forensic psychiatric treatment, the SMR was 9.2 among male patients and 40.5 among female patients [7]. Of these deaths 55% were due to somatic diseases, 30% due to suicide, 10% were suspected suicides and 5% were due to the consequences of substance abuse.

In a meta-analysis of eight publications reporting mortality and two additional studies concentrating solely on suicides, the all cause crude death rates (CDRs) of forensic psychiatric patients ranged from 789 to 2828 per 100,000 person-years and the pooled estimate for all-cause CDR was 1538 [8]. The rate was noted to be similar to a figure in a study of psychosis patients with all-cause CDR of 1417 [9]. In contrast, they differed from the corresponding figures of released prisoners for whom the pooled estimate of all-cause CDR was 850 [10], suggesting that it is the mental illness rather than the

CONTACT Ilkka Ojansuu ilkka.ojansuu@niuva.fi Kuopio University Hospital, Niuvanniemi Hospital, Niuvankuja 65, 70240 Kuopio, Finland

forensic background that is responsible for the increased mortality risk among forensic psychiatric patients.

Aim

The purpose of this study was to analyze the causes of mortality among patients committed to compulsory forensic psychiatric hospital treatment in Finland during 1980–2009 by categorizing the causes of mortality into somatic diseases, suicides and other unnatural deaths. By revealing the causes of excess mortality, we intend to provide new knowledge in an effort to reduce the mortality gap between forensic psychiatric patients and the general population.

Materials and methods

In Finland, a court decides if it is necessary to perform a forensic examination to assess the criminal responsibility of a defendant. The court may order a forensic examination to be performed if the defendant has been found guilty of a serious crime that may lead to a conviction of more than one year imprisonment or if the defendant requests the forensic examination. After the forensic examination, if the defendant is assessed as suffering from a serious mental disorder (psychosis) and due to this psychotic mental disorder considered to have been incapable to understand the true meaning of his/her actions and/or incapable to control his/her actions during the offense, he/she can be exempted from legal punishment and be committed to compulsory forensic psychiatric hospital treatment. In the final stage of the hospital treatment, the patient can be released in a supervised leave although he/she will still be under compulsory treatment. Most of the forensic psychiatric patients are on this kind of a supervised leave prior to the discharge from the hospital. A supervised leave may last up to six months and these periods may be repeated if needed. After his/her ultimate discharge from the hospital, the psychiatric care is no longer mandatory and ex-forensic psychiatric patients are legally regarded in the same manner as other psychiatric outpatients with no obligatory follow up. In Finland, legislation does not allow for compulsory outpatient care for any psychiatric patient.

This study population consists of the patients committed to compulsory forensic psychiatric hospital treatment in Finland in the thirty year period from 1980 to 2009. The material for this study was gathered from the National Institute for Health and Welfare's (THL) archive, which includes data on all Finnish forensic psychiatric reports and the information of patients who have been committed to forensic psychiatric hospital treatment. During the years 1980–2009, 1253 patients were committed to forensic psychiatric hospital treatment in Finland. The majority of them were schizophrenia spectrum patients. The mean follow-up of these patients was 15.1 years (range 0.0–31.9 years), and it ended on 31.12.2011 or when the patient had died. The mean age of a patient at the time of the forensic examination was 37.5 years (range 15.4–82.9 years). For those patients who were discharged from the forensic psychiatric hospital treatment to the outpatient care ($N = 832$), the mean duration of the hospital treatment was 5.9 years (range 0.1–29.1 years). For discharged male patients ($N = 723$), the mean forensic psychiatric hospital treatment duration was 6.1 years (range 0.1–29.1 years) and the corresponding value for female patients ($N = 109$) was 4.8 years (range 0.1–19.9 years).

In order to define the mortality among patients in the study group, they were linked to the national death register of the Statistics Finland, which contains information about all deaths in Finland. Depending on the cause of death stated in the patients' death certificates, these were categorized into somatic diseases, suicides, accidents and homicides. The SMR was calculated in each section and in an effort to increase statistical power, violent deaths, that is accidents and homicides, were combined in the same section. The SMR was calculated as the ratio of observed and expected number of deaths by using subject-years methods with 95% confidence intervals, assuming a Poisson distribution. The expected number of deaths was calculated on the basis of sex-, age- and calendar-period-specific mortality rates in the Finnish population.

This study was a part of the transnational After Care project. Ethics committee approvals for the study were obtained from the Research Ethics Committees of Kuopio, Oulu and Turku Universities, Kuopio, Helsinki and Turku University Hospitals, Health Centre of City of Helsinki, Hospital District of Southern Savo, and The Hospital District of Pirkanmaa. This study was approved and the study material gathered from the Finland's National Institute for Health and Welfare and by Statistics Finland. This study was purely registry based and no contacts were made with the subjects of the study.

Results

During the follow-up, a total of 351 patients died. The vast majority of deaths (249, 79%), were attributable to somatic diseases. Fifty-nine deaths (16.8%) were due to suicides, 32 (9.1%) deaths were accidental and four patients (1.1%) were victims of homicides. For 7 patients, the cause of death remained indefinite even after the forensic autopsy and it had therefore been classified as unclear in their death certificate. The causes of deaths are presented in Table 1.

Table 1. The numbers and proportion of deaths due to different causes.

Cause of death	*N*	%
Somatic disease	249	71.0
Heart and circulatory system diseases	110	31.3
Respiratory system diseases	30	8.6
Cancer diseases	63	18.0
Other somatic diseases	46	13.1
Suicide	59	16.8
Suicide by hanging	27	7.7
Suicide by drug overdose	15	4.3
Suicide by jumping from a height	6	1.7
Suicide by drowning	4	1.1
Suicide by other means	7	2.0
Unnatural cause of death other than suicide	36	10.3
Homicide	4	1.1
Accidental death	32	9.1
Cause of death unclear	7	2.0
All causes of death	351	100

The SMRs and mean ages at death are presented in Table 2, excluding the 7 unclear deaths.

Of the 59 suicide deaths, 31 (52.5%) suicides were committed during the forensic psychiatric hospital treatment (median 2.1 years in treatment, range 0.1–14.2 years) and 28 (47.5%) suicides were committed after the discharge from the hospital (median 3.4 years after the discharge, range 0.1–17.3 years). The associations between the suicides and time in forensic psychiatric hospital treatment or time after the discharge from the hospital are shown in Figure 1.

Of the 249 deaths due to somatic diseases, 61 (24.5%) deaths occurred during the forensic psychiatric hospital treatment (median 4.2 years in treatment, range 0.02–24.1 years), whereas after hospital discharge, there were 188 (75.5%) of these types of deaths (median 8.7 years after the discharge, range 0.1–27.7). The associations between deaths due to diseases and time in the forensic psychiatric hospital treatment or time after the discharge from the hospital are presented in Figure 2.

Of the 4 homicides, 1 occurred during the forensic psychiatric hospital treatment (1.2 years in treatment) while the patient was on an approved leave from the hospital. The other three homicides happened after discharge from the hospital (median 7.4 years after the discharge, range 1.5–12.6 years).

With respect to the 32 accidental deaths, 3 male deaths occurred during the forensic psychiatric hospital treatment (median 7.7 years in treatment, range 2.0–19.1 years) and 29 accidental deaths occurred after the discharge from the hospital (median 7.3 years after the discharge, range 0.9–20.2 years).

Table 2. SMRs and mean ages (years) at the time of death of the deceased patients.

	All	Male	Female
Deaths (*N*)	351	318	33
Age (range)	56.2 (19.8–87.8)	56.1 (20.3–87.8)	57.0 (19.8–84.3)
Suicides (*N*)	59	53	6
Age (range)	40.2 (19.8–76.7)	41.3 (21.0–76.7)	30.7 (19.8–38.0)
SMR (95% CI)	7.1 (5.5–9.2)	6.6 (5.1–8.7)	19.5 (8.8–43.4)
Diseases (*N*)	249	223	26
Age (range)	61.1 (20.3–87.8)	60.7 (20.3–87.8)	64.1 (43.3–84.3)
SMR (95% CI)	2.6 (2.3–2.9)	2.5 (2.2–2.9)	3.1 (2.1–4.6)
Accidents (*N*)	32	31	1
Age (range)	51.9 (32.2–81.8)	52.5 (32.3–81.8)	32.2 (32.2–32.2)
Homicides (*N*)	4	4	0
Age (range)	39.5 (32.8–50.8)	39.5 (32.8–50.8)	
Accidents and homicides (*N*)	36	35	1
SMR (95% CI)	1.7 (1.2–2.4)	1.8 (1.3–2.5)	1.3 (0.2–8.9)

Conclusions

This study revealed that although the majority of the mortality among forensic psychiatric patients in Finland can be traced to somatic diseases, the major difference to the general population is that a forensic psychiatric patient was seven times more likely to commit suicide. Furthermore, on average, the suicide deaths or those caused by other unnatural causes occurred at a younger age and therefore caused more life years lost.

When the results of this study are compared to previous reports, it should be noted that the composition of the study populations may be very different, for example, is the study population made up of patients committed to be treated in forensic psychiatric hospital after criminal behavior or is it patients from community that are admitted for serious symptoms but non-criminal behavior? In addition, the admission criteria for involuntary psychiatric treatment vary from country to country. For example, in some countries, a patient can be committed to psychiatric treatment if he/she is diagnosed with a psychopathic disorder, whereas in Finland, an adult patient in involuntary psychiatric treatment must be diagnosed to have a mental disorder with psychotic symptoms. When compared to the previous studies which have investigated the mortality among forensic psychiatric patients [5–7], the mortality is lower in this study; this might be a result of the larger study population and the differences between the study groups. It could be also that there are certain factors in

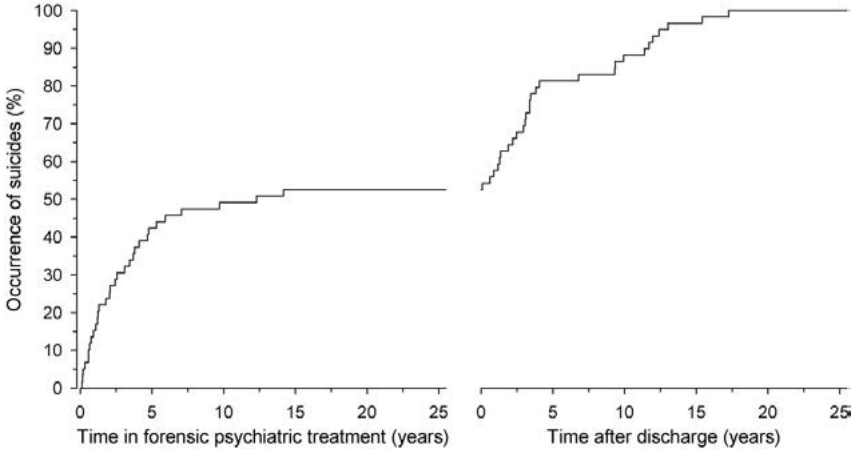

Figure 1. Percentual occurrence of suicides during time (years) in forensic psychiatric treatment and time after discharge.

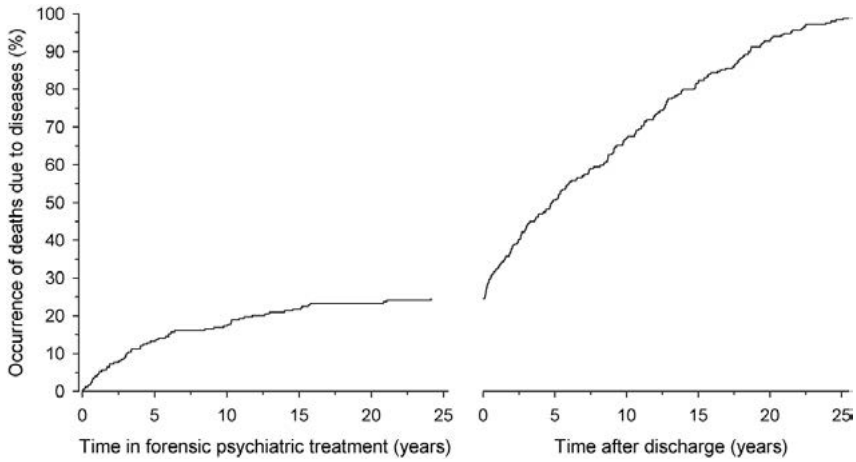

Figure 2. Percentual occurrence of deaths due to diseases during time (years) in forensic psychiatric treatment and time after discharge.

Finnish forensic psychiatric treatment system that contribute to the lower mortality.

The overall mortality noted in this study among forensic psychiatric patients is identical with the mortality noted in a previous study of schizophrenia-spectrum patients in Finland [3]. This strengthens the proposal based on the previous meta-analysis [8] that it is the mental illness rather than the forensic background that is responsible for the increased mortality among forensic psychiatric patients. The high mortality due to suicides among forensic psychiatric patients observed in our study is unacceptable, but it is also noteworthy that the mortality due to suicides, although higher than in the general population, is somewhat lower that reported in previous studies of forensic psychiatric patients [5–7] as well as among Finnish schizophrenia spectrum patients [3]. The difference between suicide mortality in our study and the previous forensic psychiatric patient studies is also likely not only to originate from differences between the study groups but also due to differences in treatment systems. For example, the difference in suicide mortality between the value found here and that of Finnish schizophrenia patients may be due to the former's prolonged duration of hospital treatment, which is likely to be a protective factor, since it is known that the suicide risk is higher among psychiatric patients who receive only a short hospital treatment [11].

Over half of the suicides in this study occurred during the forensic psychiatric hospital treatment which reveals an obvious treatment failure in these cases. There were excessive numbers of suicides during the first years in the forensic hospital treatment but as the treatment continued, the risk of suicide appeared to decline. It is known that psychiatric patients have an increased risk of suicide and the risk peak of suicide has been shown to occur during the first week after admission to hospital [11]. Here, it was found that in these forensic psychiatric patients, the risk of suicide remained elevated for years after admission. The excessive amount of suicides during first years may be attributable to remorse for the crime as well as difficulties in adjusting to their changed circumstances. It is not only during the episodes the psychoses but also during the time of recovery that the suicide risk may be elevated in forensic psychiatric patients. During the hospital treatment, more attention should be paid to factors that are known to increase the risk of suicide such as negative attitude toward treatment, impulsivity, prior suicide attempt, high IQ, depression and a family history of suicide [12]. In addition, it would be important to identify those factors that are known to decrease the risk, such as a safe ward environment, patient visibility and supervision, careful assessment, teamwork and awareness of the risk of suicide within the hospital [13]. We recommend that there should always be a systematic investigation when a serious incident such as a suicide death occurs during the forensic psychiatric treatment.

The other risk peak for suicides among psychiatric patients is known to be in the first two weeks after hospital discharge [11,14]. Also in this respect, it was shown here that among forensic psychiatric patients, the high risk for suicide continued for years after the forensic psychiatric hospital treatment had ended. After the first years, the numbers of suicides seemed to moderate but it did seem to increase again many years after the release. The high suicide risk after the discharge from hospital may be attributable to the withdrawal of the protective factors of the treatment and difficulties in adjusting back to everyday life. Over a longer time period, the risk of suicide may again increase because of a re-occurrence of the mental disease and inadequate outpatient care. Since at this point, forensic psychiatric patients in Finland are treated as other psychiatric patients, the development of community based modern, effective and multifaceted services could be one way to avoid these suicides [15]. When organizing the outpatient care, factors known to decrease the risk of suicide should be considered, for example, withdrawing the intensive care only gradually and planning of seamless access to mental health services and useful daily activation [12,14].

Mortality due to unnatural deaths other than suicides was not as high when compared to the standard population (SMR 1.7) and since there was only one female death in this group, the value for women is unreliable (SMR 1.3; 95% CI 0.2–8.9). These deaths were more common after the discharge from the forensic psychiatric hospital treatment, which could be due to many reasons, for example, loss of the protective factors available in the hospital, lack of compliance, as well as relapse of the mental disorder. In addition, a possible cognitive deficiency associated with the mental disease as well as the adverse effects of medication are likely to increase the risk of accidents. Patients with mental disorders are known to have a highly elevated risk of an accidental death, with excessive alcohol consumption and other substance use disorders being the strongest risk factors [16].

Not unexpectedly, the percentual occurrence of deaths caused by somatic diseases increased over the course of time of this study. The numbers of these deaths would almost inevitably increase if the follow-up had been longer, since death due to a somatic disease is a natural end point unless the patient commits suicide, or is homicide victim or is involved in a fatal accident. This means that the percentual occurrence of unnatural deaths is overrepresented since only part of the study group had died by the end of the follow-up. The SMR of 2.6 estimated in this study still reveals the excess mortality due to somatic diseases among forensic psychiatric patients and it is similar to the mortality due to diseases in nonforensic Finnish schizophrenia patients [3]. It is known that many physical illnesses are more common among patients suffering a severe mental illness. Poor dietary habits, lack of exercise, smoking and adverse effects of medications are some of the factors known to be implicated in the excess mortality [17,18]. It is also recognized that psychiatric patients are less likely to receive proper treatment for somatic diseases [19]. In this study, the majority of deaths due to somatic diseases occurred after the discharge from the hospital treatment. This can in part be due to the healthcare provided and more healthy lifestyle when they were receiving the (compulsory) treatment in the forensic psychiatric hospital. The increased mortality due to somatic diseases after discharge could be partly a consequence of the withdrawal of these protective factors and possibly to subsequent difficulties in receiving the proper out-patient care. During the year 2011, three major causes of death in Finland were (1) diseases of circulatory system (40% of deaths), (2) cancer (24%) and (3) diseases of respiratory system (4%) [20]. The percentual occurrence of these causes of deaths among forensic psychiatric patients in this study was similar, that is (1) deaths due to diseases of circulatory system (31%), (2) cancer (18%); it should be noted that these causes of deaths would most likely increase if we employed a longer follow-up. The deaths due to diseases of respiratory system (8%) were slightly more common in our psychiatric patients already at this point which could be a consequence of their frequent smoking habits.

The strengths of our study are the large sample of forensic psychiatric patients and the mean follow-up time of 15.1 years, the possibility to use the death register of Statistics Finland that holds the cause of death register of citizens and permanent residents in Finland and the access to the Finnish system of death certificate forms, death certification practices and the standardized cause of death validation procedure that have been shown to serve as a solid background in epidemiological studies on mortality [21]. The weakness of this study is that after the patients were discharged from the forensic psychiatric hospital treatment, there is no knowledge of their involvement in outpatient care or their use of medication. In addition, substance disorders are known to increase mortality of psychiatric patients [22,23] and in this study group substance use disorders were not evaluated as a variable. This calls for further studies to research the proportion of substance use disorders as a factor causing increased mortality among forensic psychiatric patients.

The results of this study emphasize that the high risk of suicide should be noted not only during the hospital treatment of forensic psychiatric patients but also when the outpatient care is being organized. The risk of accidents should be evaluated and it should be assured that the proper somatic healthcare continues also in the outpatient setting. The excess mortality in forensic psychiatric patients with a criminal background and severe mental illness highlights why support and care should be targeted to these patients both during their stay in hospital and after their discharge. After all, a civilization is measured by how it treats its weakest members.

Acknowledgements

We thank Hannu Kautiainen (Medcare Oy) for his work with statistical analyses and both Aija Räsänen and Kirsi Niinistö for secretarial assistance.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The study was funded by the Ministry of Social Affairs and Health, Finland, through the developmental fund for Niuvanniemi hospital. The funder was not involved in the conduct of the study or in the collection, management, analysis or interpretation of the data.

References

[1] Harris EC, Barraclough B. Excess mortality of mental disorder. Br J Psychiatry. 1998;173:11–53.
[2] Joukamaa M, Heliövaara M, Knekt P, et al. Mental disorders and cause-specific mortality. Br J Psychiatry. 2001;179:498–502.
[3] Nordentoft M, Wahlbeck K, Hällgren J, et al. Excess mortality, causes of death and life expectancy in 270,770 patients with recent onset of mental disorders in Denmark, Finland and Sweden. PLoS One. 2013;8:e55176.
[4] Ojansuu I, Putkonen H, Tiihonen J. Mortality among forensic psychiatric patients in Finland. Nord J Psychiatry. 2015;69:25–27.
[5] Davies S, Clarke M, Hollin C, et al. Long-term outcomes after discharge from medium secure care: a cause for concern. Br J Psychiatry. 2007;191:70–74.
[6] Jones RM, Hales H, Butwell M, et al. Suicide in high security hospital patients. Soc Psychiatry Psychiatr Epidemiol. 2011;46:723–731.

[7] Tabita B, de Santi MG, Kjellin L. Criminal recidivism and mortality among patients discharged from a forensic medium secure hospital. Nord J Psychiatry. 2012;66:283–289.
[8] Fazel S, Fiminska Z, Cocks C, et al. Patient outcomes following discharge from secure psychiatric hospitals: systematic review and meta-analysis. Br J Psychiatry. 2016;208:17–25.
[9] Dutta R, Murray RM, Allardyce J, et al. Mortality in first-contact psychosis patients in the U.K.: a cohort study. Psychol Med. 2012;42:1649–1661.
[10] Zlodre J, Fazel S. All-cause and external mortality in released prisoners: systematic review and meta-analysis. Am J Public Health. 2012;102:e67–e75.
[11] Qin P, Nordentoft M. Suicide risk in relation to psychiatric hospitalization: evidence based on longitudinal registers. Arch Gen Psychiatry. 2005;62:427–432.
[12] De Hert M, McKenzie K, Peuskens J. Risk factors for suicide in young people suffering from schizophrenia: a long-term follow-up study. Schizophr Res. 2001;47:127–134.
[13] Sakinofsky I. Preventing suicide among inpatients. Can J Psychiatry. 2014;59:131–140.
[14] Meehan J, Kapur N, Hunt IM, et al. Suicide in mental health inpatients and within 3 months of discharge. National clinical survey. Br J Psychiatry. 2006;188:129–134.
[15] Pirkola S, Sund R, Sailas E, et al. Community mental-health services and suicide rate in Finland: a nationwide small-area analysis. Lancet. 2009;373:147–153.
[16] Crump C, Sundquist K, Winkleby MA, et al. Mental disorders and risk of accidental death. Br J Psychiatry. 2013;203:297–302.
[17] Brown S, Birtwistle J, Roe L, et al. The unhealthy lifestyle of people with schizophrenia. Psychol Med. 1999;29:697–701.
[18] Osborn DP, Nazareth I, King MB. Physical activity, dietary habits and Coronary Heart Disease risk factor knowledge amongst people with severe mental illness: a cross sectional comparative study in primary care. Soc Psychiatry Psychiatr Epidemiol. 2007;42:787–793.
[19] De Hert M, Cohen D, Bobes J, et al. Physical illness in patients with severe mental disorders. II. Barriers to care, monitoring and treatment guidelines, plus recommendations at the system and individual level. World Psychiatry. 2011;10:138–151.
[20] Suomen virallinen tilasto (SVT) Kuolemansyyt [internet]. ISSN =1799-5051. Liitetaulukko 1a. Kuolleet peruskuolemansyyn (54-luokkainen luokitus) ja iän mukaan 2011, molemmat sukupuolet. [cited 2017 Jul 10]. Available from: http://www.stat.fi/til/ksyyt/2011/ksyyt_2011_2012-12-21_tau_001_fi.html
[21] Lahti RA, Penttilä A. The validity of death certificates: routine validation of death certification and its effects on mortality statistics. Forensic Sci Int. 2001;115:15–32.
[22] Steingrímsson S, Sigurdsson MI, Aspelund T, et al. Total population-based study of the impact of substance use disorders on the overall survival of psychiatric inpatients. Nord J Psychiatry. 2016;70:161–166.
[23] Hjorthøj C, Østergaard ML, Benros ME, et al. Association between alcohol and substance use disorders and all-cause and cause-specific mortality in schizophrenia, bipolar disorder, and unipolar depression: a nationwide, prospective, register-based study. Lancet Psychiatry. 2015;2:801–808.

III

Substance abuse and excessive mortality among forensic psychiatric patients: a Finnish nationwide cohort study

Ojansuu I, Putkonen H, Lähteenvuo M and Tiihonen J

Front Psychiatry 10: 678, 2019

frontiers in Psychiatry

ORIGINAL RESEARCH
published: 13 September 2019
doi: 10.3389/fpsyt.2019.00678

Substance Abuse and Excessive Mortality Among Forensic Psychiatric Patients: A Finnish Nationwide Cohort Study

Ilkka Ojansuu[1], Hanna Putkonen[2], Markku Lähteenvuo[1,3†] and Jari Tiihonen[1,4,5†]*

[1] Department of Forensic Psychiatry, Niuvanniemi Hospital, Kuopio, Finland, [2] Addiction Psychiatry, University of Helsinki and Helsinki University Hospital, Helsinki, Finland, [3] Institute for Molecular Medicine Finland (FIMM), University of Helsinki, Helsinki, Finland, [4] Department of Clinical Neuroscience and Center for Psychiatry Research, Karolinska Institutet, Stockholm City Council, Stockholm, Sweden, [5] Department of Forensic Psychiatry, University of Eastern Finland, Kuopio, Finland

OPEN ACCESS

Edited by:
Björn Hofvander,
Lund University, Sweden

Reviewed by:
Kolja Schiltz,
Ludwig Maximilian
University of Munich, Germany
Peter Andiné,
University of Gothenburg,
Sweden

****Correspondence:***
Ilkka Ojansuu
ilkka.ojansuu@niuva.fi

†These authors have contributed equally to this work and share last authorship

Specialty section:
This article was submitted to Forensic Psychiatry, a section of the journal Frontiers in Psychiatry

Received: *03 June 2019*
Accepted: *22 August 2019*
Published: *13 September 2019*

Citation:
Ojansuu I, Putkonen H, Lähteenvuo M and Tiihonen J (2019) Substance Abuse and Excessive Mortality Among Forensic Psychiatric Patients: A Finnish Nationwide Cohort Study. Front. Psychiatry 10:678. doi: 10.3389/fpsyt.2019.00678

Background: Forensic psychiatric patients are known to have reduced life expectancy. The aim of this study was to explore to what extent substance abuse disorders account for this increased mortality.

Methods: Data up to December 31, 2016 for mortality (causes of death register) and substance abuse (forensic psychiatric examinations) were collected for all of the 950 patients committed to involuntary forensic psychiatric hospital care in Finland during 1980–2009 and discharged no later than December 31, 2016. Patients were then classified as suffering or not suffering from substance abuse disorders and their causes of death were examined. The standardized mortality ratio was then calculated for these groups on the basis of sex-, age-, and calendar-period-specific mortality rates for the general Finnish population.

Results: During the follow-up time (mean 13.4 years), 354 (320 men, 34 women) patients died, resulting in a standardized mortality ratio of 3.5. The standardized mortality ratio for the patients with a history of substance abuse disorders was 4.1 compared to 2.8 for those with no such history. Among men, but not women, the age-adjusted proportion of death was significantly higher for those with a history of substance abuse disorders. In addition, in patients with a history of substance abuse disorders, the male age-adjusted competing risk of mortality was higher for unnatural causes, but not natural causes. Furthermore, a prominent proportion (16%) of all deaths and a majority of the accidental deaths (64%) occurred under the influence of some substance.

Conclusions: Substance abuse is a major factor causing excessive mortality among forensic psychiatric patients. The management of substance abuse problems should be one cornerstone of the treatment of patients with both severe mental disorders and substance abuse disorders during their time in hospital and this should be extended to outpatient care.

Keywords: forensic psychiatry, mental illness, substance abuse, mortality, accidental death

INTRODUCTION

All major psychiatric disorders are associated with an increased risk of premature mortality (1). The mortality of patients discharged from a psychiatric hospital has been found to be four-fold higher than the general population in a Finnish sample (2). The mortality associated with substance abuse disorders has been found to be even higher than that associated with serious psychiatric disorders, like schizophrenia, schizoaffective disorder, or bipolar disorder (3, 4). This risk for premature mortality seems, at least to some extent, to be additive, as patients with both comorbid substance abuse and serious mental disorders are at an even higher risk (5, 6, 7).

It is not surprising that the mortality of forensic psychiatric patients, who often suffer from both serious psychiatric disorders as well as substance use disorders (SUDs), is higher than that of the general population. In a Swedish sample, the mortality of forensic psychiatric patients was found to be higher, if the primary diagnosis was that they were suffering from a substance abuse disorder (8). This was also the case for forensic patients with a secondary diagnosis of a substance abuse disorder, unless they were suffering primarily from bipolar disorder. However, only 34% of the Swedish sample consisted of patients diagnosed with schizophrenia or some other psychotic disorder. This sample included patients from many decades, and it need be noted that the average treatment time of the sample was stated to have been only 5 months, which might not reflect current practice. In Finland, in order to treat individuals as forensic psychiatric patients, they are required to have a diagnosis of a psychotic disorder and the average treatment times are on average many years (9). In a Finnish study, the mortality among forensic psychiatric patients was found to be up to three-fold higher than the general population, but somewhat comparable to that of other schizophrenia spectrum patients (4, 9). When the causes of death were further examined, most of the deaths in the forensic psychiatric patients were due to somatic illnesses, although the largest difference, i.e., as much as seven-fold elevated risk, was attributable to suicide (10).

The problem in extrapolating these data for forensic patients from country to country is that the criteria for placing an individual into forensic psychiatric care vary between countries, as do treatment practices, even though in general, the psychiatric treatment protocols might be similar. Thus, results from different countries might not be generalizable, unless these criteria and their treatment protocols are similar. There is a rather sparse literature on the effect of substance abuse disorders on mortality in forensic psychiatric patients with psychotic disorders. It is evident that a more detailed knowledge of the factors behind the increased mortality observed in forensic psychiatric patients is needed to guide treatment decisions towards reducing these substantial risks.

The aim of this study was to explore the extent to which substance abuse disorders contribute to the increased mortality observed in forensic psychiatric patients, even when treatments times, and thus periods of abstinence, are long. This information would be of major clinical interest, since there is a dogma surrounding many addictive disorders that the time of abstinence itself is a protective factor against relapse and further that relapse is a risk factor for increased mortality. If a long period of abstinence *per se* is not sufficient to prevent relapses for substance abuse disorders, then it is clear that there is a need to devise alternative treatment modalities for patients with substance abuse problems in forensic psychiatric hospitals.

MATERIALS AND METHODS

In Finland, the law court decides whether it is necessary to perform a forensic psychiatric examination which assesses the criminal responsibility of a defendant. Usually defendants committing homicides, or individuals who, due to their medical history or behaviour in detention, are thought to be affected by a psychiatric disorder, are subjected to a forensic psychiatric examination. After the forensic psychiatric examination, if the defendant is assessed as suffering from a serious mental disorder (psychosis or other disorders that affect reality testing, but not intellectual disability, autism or SUD by themselves), he/she can be exempted from legal punishment and be committed to involuntary forensic psychiatric hospital care. In the final stage of hospital treatment, the patient can be released on supervised leave, although he/she will still be under involuntary care. A supervised leave may be granted for up to 6 months at a time; furthermore, there can be multiple supervised leaves before ultimate hospital discharge. Most of the forensic psychiatric patients undergo this form of supervised leave prior to their final hospital discharge. After the patient's ultimate discharge from hospital, psychiatric outpatient care is not mandatory; in legal terms, ex-forensic psychiatric patients are regarded in the same manner as other psychiatric outpatients. Finnish legislation does not allow for compulsory or involuntary outpatient care for any psychiatric patient. The Finnish National Institute for Health and Welfare (THL) is responsible for both the initiation and termination of involuntary psychiatric forensic hospital care.

Data Acquisition

The material for this study was collected from the Finnish National Institute for Health and Welfare's archive, which houses data on all Finnish forensic psychiatric examinations and the information of patients who have been committed to or released from involuntary forensic psychiatric hospital care. The data from patients which constituted this study group were then linked to the national cause of death register of Statistics Finland, which contains information on all deaths in Finland, including data on causes of and events related to death, which made it possible to estimate mortality. Standard mortality data for the general population, to be used as control data, were also retrieved from this register.

Analyses

Our study population consisted of the 950 patients who had been committed to involuntary forensic psychiatric hospital

care in Finland during the 30-year period from 1980 to 2009 and were discharged no later than 31.12.2016 (total number of patients committed during this time was 1,253). Follow-up started on hospital discharge and ended either on 31.12.2016 or when the patient died, whichever came sooner. The data for initial diagnoses (for psychosis and SUDs) were recorded from the forensic psychiatric examinations, which were then further screened for signs of SUDs not recorded in the diagnoses section, since the primary function of the examinations is to provide information on the individual's mental state (e.g., psychotic symptomology) and substance abuse disorders are sometimes omitted from the diagnoses section as they may be thought to either be secondary to the evaluation or to have arisen from the psychotic disorder. These data were pooled together to classify a patient as suffering or not suffering from an SUD according to ICD-10 criteria. Sometimes, it proved difficult to ascertain enough information to determine whether the criteria for addiction had been fulfilled, although harmful use was clearly evident. Patients with current unequivocal evidence of harmful use or addiction were classified as having an SUD, regardless of which substance was being abused (ICD-10: F1x.1 - F1x.2). Those patients for whom there was only evidence of intoxication or withdrawal symptoms without a longer standing substance abuse disorder, patients with only prior evidence of SUDs without current use, or patients without any evidence of an SUD were classified as not having an SUD.

Data on causes of death and events related to death from the patients were then retrieved up to 31.12.2016 from the cause of death register, and the causes of death were then categorized as being due to somatic diseases, suicides, accidents, homicides, or unclear. If signs of substance use at time of death or prior to death were evident from the death certificates, these were also recorded.

The Standardized Mortality Ratio (SMR) was then calculated for all patients, grouping the patients as either suffering or not suffering from SUD as described above. The SMR was calculated as the ratio of observed and expected number of deaths by using subject-years methods with 95% confidence intervals, assuming a Poisson distribution. The expected number of deaths was calculated on the basis of sex-, age-, and calendar-period-specific mortality rates in the general Finnish population. We used Cox proportional hazards model to calculate the age adjusted hazard ratios HR for death and adjusted survival (failure) function. A competing-risks regression model (Fine and Gray model) with a robust estimate of variance served to estimate the adjusted subhazard ratios (sHR) and cumulative incidence in the presence of competing risks. Stata 15.0 (StataCorp LP, College Station, TX, USA) statistical package was used for the analysis.

Ethical Considerations and Approval

This study is a part of the transnational After Care project. Ethics committee approvals for the study were sought and obtained from the Research Ethics Committees of Kuopio, Oulu and Turku Universities, Kuopio, Helsinki and Turku University Hospitals, Healthcare Centre of the City of Helsinki, Hospital District of Southern Savo, and the Hospital District of Pirkanmaa. This study was also approved by and the study material gathered from the Finnish National Institute for Health and Welfare and Statistics Finland. This study was registry based, and no contact was made with the study subjects.

RESULTS

There was a total of 950 forensic patients detected and included in the analyses. All of the patients were diagnosed as suffering from a psychotic disorder; the majority of them had a schizophrenia spectrum disorder, more specifically 59% had schizophrenia (ICD-10: F20.x), 13% had delusional disorder (F22.x), 9% had schizoaffective disorder (F25.x), and the rest other psychiatric disorders affecting reality testing, such as severe bipolar disorder, psychotic depression, organic brain injuries, or severe borderline personality disorder. The vast majority (823 = 86.6%) of the 950 forensic psychiatric patients were men and 127 (13.4%) were women. The mean duration of forensic psychiatric treatment had been 6.7 years [standard deviation (SD) 5.5], and the mean age of the patient was 43 years (SD 13) at the time of his/her discharge. The mean follow-up time was 13.4 years (SD 9.3 years). In Finland, a substance abuse disorder in itself is not sufficient grounds for treatment as a forensic psychiatric patient, but the majority (567 = 59.7%) of the patients (514 men, 53 women) were noted as suffering from a comorbid SUD according to ICD-10 criteria (either addiction or harmful use) in conjunction with their psychotic disorder. Of these 567 patients with an SUD, 395 were diagnosed prior to or during the forensic psychiatric examination; the other 172 were classified as having an SUD according to the examination notes of the forensic psychiatrist, even though no official diagnoses had been set for them.

During the follow-up, a total of 354 patients died. The mean follow-up time for these patients was 10.3 years (SD 8.1), resulting in a SMR of 3.5 for the whole patient population. The vast majority of deaths (264 = 74.6%) were attributable to somatic diseases; 80 (22.6%) of the deaths were due to unnatural causes (accidents, suicides, homicides); and in 10 (2.8%) cases, the cause of death had remained undefined even after forensic autopsy and had therefore been classified as unclear in their death certificate.

Most, 320, of the 354 deceased patients were men and 34 were women. Among these deceased patients, 218 were noted as having a substance abuse disorder during their forensic psychiatric examination. The SMR for the patients with an SUD was 4.1, whereas the SMR for the patients without an SUD was 2.8.

Among men, the age-adjusted proportion of death was significantly higher among those with an SUD when compared to those without this disorder [hazard ratio (HR) = 1.34, 95% confidence interval (95% CI) 1.07 to 1.69, p = 0.012], but this kind of difference was not observed among women (HR = 1.00, 95% CI 0.50 to 2.01, p = 0.99). The age adjusted proportions of death are shown in **Figure 1**.

The age-adjusted competing risk of mortality among men with a known SUD was not higher for the risk of death due to diseases

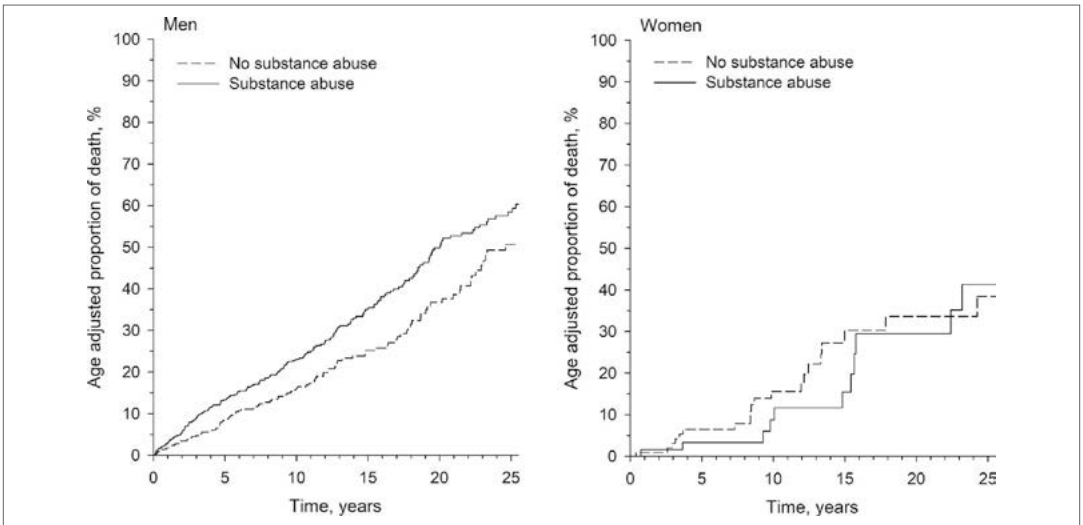

FIGURE 1 | Age-adjusted proportions of death in percentages as a function of follow-up time for men and women with or without a substance use disorder.

(sHR 0.95, 95% CI 0.73 to 1.24, p = 0.70), but was significantly higher for the risk of dying from unnatural causes (sHR 2.63, 95% CI 1.55 to 4.47, p = 0.015). The competing mortality risks for men are shown in **Figure 2**.

Many of the examined death certificates mentioned that the current status of substance use preceding death was not known, though in many of the cases even when a background of substance use was recognized, the relationship between substance use and death remained somewhat obscure. However, in 56 of the 354 deaths, there was clear evidence of current substance use listed in the death certificates, such as evidence of intoxication or withdrawal symptoms at time of death or the fact that the subject had been found deceased with items for substance use, such as needles and syringes or alcohol. Of these 56 deceased, 47 had a history of SUD, only 9 did not (Chi^2 statistic 14.04, p > 0.001 for history of an SUD vs. evidence of substance use at time of death, **Table 1**). Deaths related to current substance use with regard to history of an SUD are presented in **Table 1**. The numbers of deaths with/without current evidence of substance use, subdivided into causes of death, and the percentage of patients with or without clear evidence of current substance use at time of death are presented in **Table 2**.

If one assesses the natural deaths, then the cause of death was stated to have been directly caused by substance abuse in 10 patients; in more specific terms, three had alcohol related liver cirrhosis, three had alcohol related heart disease, one had combined alcohol related liver cirrhosis and heart disease, one had alcohol dementia, and for two, the main cause of death had been listed as SUD.

The majority (28/44 = 64%) of the unnatural deaths due to accidents were substance related. Fifteen of these deaths were attributable to substance overdoses or poisonings, 10 of which were alcohol intoxications. Of the remaining 13 substance related accidental deaths, four individuals had choked on food, two had died of subdural hemorrhage, one had frozen to death, one had drowned, one had died due to carbon monoxide poisoning, and one had suffocated after passing out in an awkward position, all while intoxicated. Three deaths happened during the withdrawal stage: one patient had frozen to death, one died of a subdural hemorrhage, and one due to clozapine poisoning after an extended period of drinking.

In 10 cases, the classification of death was unclear; for example, in some cases, it could not be determined whether a blunt force trauma was due to an accident or suicide, but in 5 of these cases, there was evidence of substance use.

DISCUSSION

Our results show that even after a long period of abstinence due to institutionalized forensic psychiatric care, especially men with a history of substance abuse disorders, in comparison with their counterparts without such a background, still have a significantly elevated risk for premature mortality after their release from care, especially due to unnatural causes. The same phenomenon was not observed in women, but this might be due either to actual gender-related differences or possibly due to the small sample size of our female study population. Furthermore, many of the deaths observed in the patient groups

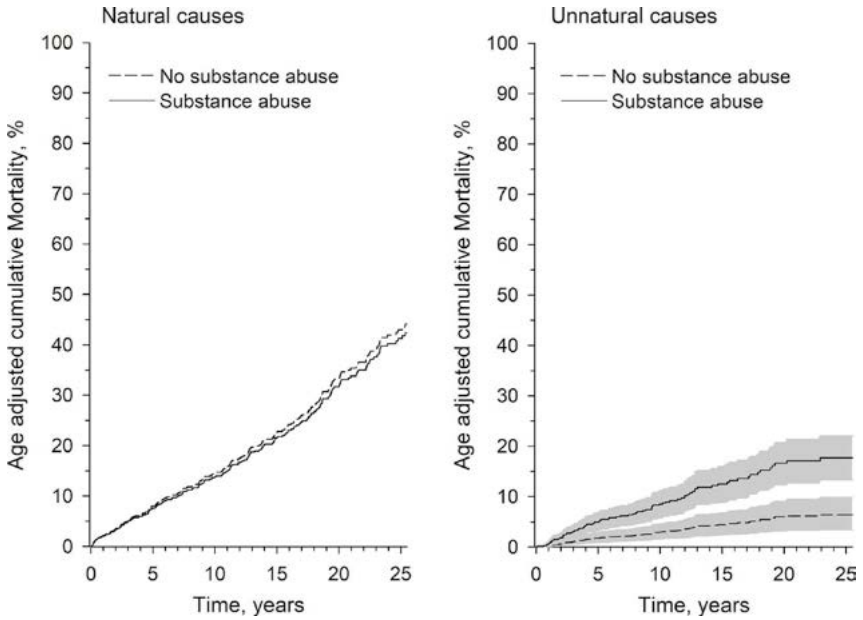

FIGURE 2 | Age-adjusted competing risk of mortality in percentages as a function of follow-up time in men with or without a substance use disorder for both natural and unnatural causes. The figure for unnatural death displays hazard ratios (lines) and confidence intervals (shadings around lines).

TABLE 1 | Number of deaths related to current substance use with regard to history of substance use disorder (Chi^2 statistic 14.04, $p > 0.001$).

Chi^2	Deaths related to current substance use	Deaths unrelated to current substance use
History of SUD	47	171
No history of SUD	9	127

TABLE 2 | Number of deaths with/without current evidence of substance use subdivided into causes of death and by gender. The percentage of patients with or without clear evidence of current substance use at time of death is given in parentheses.

	Men	Women	Total
Suicide			33
– substance use related	3	0	– 3 (9%)
– substance use unrelated	27	3	– 30 (91%)
Accident			44
– substance use related	27	1	– 28 (64%)
– substance use unrelated	14	2	– 16 (36%)
Homicide			3
– substance use related	1	0	– 1 (33%)
– substance use unrelated	2	0	– 2 (67%)
Unclear			10
– substance use related	5	0	– 5 (50%)
– substance use unrelated	5	0	– 5 (50%)
Disease			264
– substance use related	18	1	– 19 (7%)
– substance use unrelated	218	27	– 245 (93%)

actually occurred while the patient was under the influence of substances, indicating obvious relapses of their substance abuse disorder.

As compared to previous studies investigating this topic, the strengths of this study are the large sample of forensic psychiatric patients, the prolonged mean follow-up time of 13.4 years, and the possibility to access the comprehensive and validated Finnish national registers (11). One weakness of this study was that we were unable to obtain information on the living arrangements, medication use and commitment to outpatient care, inpatient care episodes, or criminal convictions after discharge from the hospital. There was also no information available on what kind of treatment, if any, patients had received for their SUDs in addition to the forced abstinence during their hospital incarceration. Also, as only patients with clear evidence of current SUDs from the forensic psychiatric examinations were classified as having an SUD, some patients with marked substance use, but not clearly reaching diagnostic thresholds as assessed from the examination statements, were classified as not having an SUD, which serves to dilute the results presented here. It need also be noted that some 30% of the patients with clear diagnostic evidence of an SUD were left without a diagnosis of such in the initial forensic psychiatric mental state examinations, which could indicate a serious defect in recognizing substance abuse disorders and even possibly led to failure to provide proper treatment for them. It is also worth noting that knowledge of possible relapses to substance use was

only available for those patients in whom it was mentioned in their death certificates. Thus, it is possible, perhaps even likely, that the overall rates of substance use relapses were higher. Some of the patients in the "no prior history of substance abuse" group might also have developed SUDs during their follow-up time, i.e., the present findings may be an underestimation. The data are thus subject to confounding by indication. In addition, as the current study is an observational registry based study, the data presented are only correlations, and only speculations of causality can be made.

In this study, the presence of substance abuse was found to contribute to mortality in the background of some somatic diseases, but it was especially evident in the large proportion of deaths due to accidents. Thus, although substance abuse might not be the only problem responsible for poor coping in some individuals, it is likely to be a major factor causing excessive mortality among forensic psychiatric patients due to both natural and unnatural causes. Therefore, the management of substance abuse disorders should receive a high priority in this patient group, in an attempt to reduce the excessive mortality as well as gaining other health benefits associated with reduced substance use. When viewed against the background of the long psychiatric hospital treatment provided for these patients, these results must be viewed both as a sign that abstinence in itself is not sufficient to prevent relapses and able to reduce the excessive mortality, but also as an indication of a failure to provide treatment modalities with greater efficacies.

CONCLUSION

According to our study, a history of substance abuse is related to the excessive mortality observed in Finnish forensic psychiatric patients. Thus, the integrated management of addiction problems should be one cornerstone of the treatment of patients with both severe mental disorders and substance abuse disorders not only during their time in hospital but also extended to their outpatient care.

DATA AVAILABILITY

The data analyzed in this study were obtained from Finnish national registers as described above. Due to the confidential nature of patient data, the data are not publicly available.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Research Ethics Committees of Kuopio, Oulu and Turku Universities, Kuopio, Helsinki and Turku University Hospitals, Healthcare Centre of the City of Helsinki, Hospital District of Southern Savo, and the Hospital District of Pirkanmaa. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

IO, HP, ML, and JT contributed to the conception and design of the study. IO organized the database and wrote the first draft of the manuscript. ML contributed to drafting and writing of the report. All authors contributed to manuscript revision and read and approved the submitted version.

FUNDING

The study was funded by the Ministry of Social Affairs and Health, Finland, through the developmental fund for Niuvanniemi Hospital. The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

ACKNOWLEDGMENTS

We thank Hannu Kautiainen (Medcare Oy) for his work with the statistical analyses and Aija Räsänen for secretarial assistance.

REFERENCES

1. Harris EC, Barraclough B. Excess mortality of mental disorder. *Br J Psychiatry* (1998) 173:11–53. doi: 10.1192/bjp.173.1.11
2. Sohlman B, Lehtinen V. Mortality among discharged psychiatric patients in Finland. *Acta Psychiatr Scand* (1999) 99:102–9. doi: 10.1111/j.1600-0447.1999.tb07207.x
3. Chang CK, Hayes RD, Broadbent M, Fernandes AC, Lee W, Hotopf M, et al. All-cause mortality among people with serious mental illness (SMI), substance use disorders, and depresive disorders in southeast London: a cohort study. *BMC Psychiatry* (2010) 10:77. doi: 10.1186/1471-244X-10-77
4. Nordentoft M, Wahlbeck K, Hällgren J, Westman J, Osby U, Alinaghizadeh H, et al. Excess mortality, causes of death and life expectancy in 270, 770 patients with recent onset of mental disorders in Denmark, Finland and Sweden. *PLoS One* (2013) 8(1):e55176. doi: 10.1371/journal.pone.0055176
5. Hjorthøj C, Østergaard ML, Benros ME, Toftdahl NG, Erlangsen A, Andersen JT, et al. Association between alcohol and substance use disorders and all-cause and cause specific mortality in schizophrenia, bipolar disorder, and unipolar depression: a nationwide, prospective, register-based study. *Lancet Psychiatry* (2015) 2(9):801–8. doi: 10.1016/S2215-0366(15)00207-2
6. Gregg L, Barrowclough C, Haddock G. Reasons for increased substance use in psychosis. *Clin Psychol Rev* (2007) 27(4):494–510. doi: 10.1016/j.cpr.2006.09.004
7. Rosen CS, Kuhn E, Greenbaum MA, Drescher KD. Substance abuse-related mortality among middle-aged male VA psychiatric patients. *Psychiatr Serv* (2008) 59(3):290–6. doi: 10.1176/appi.ps.59.3.290
8. Fazel S, Wolf A, Fimińska Z, Larsson H. Mortality, Rehospitalisation and violent crime in forensic psychiatric patients discharged from hospital: rates and risk factors. *PLoS One* (2016) 11(5):e0155906. doi: 10.1371/journal.pone.0159020
9. Ojansuu I, Putkonen H, Tiihonen J. Mortality among forensic psychiatric patients in Finland. *Nord J Psychiatry* (2015) 69(1):25–7. doi: 10.3109/08039488.2014.908949
10. Ojansuu I, Putkonen H, Tiihonen J. Cause-specific mortality in Finnish forensic psychiatric patients. *Nord J Psychiatry* (2018) 72(5):374–9. doi: 10.1080/08039488.2018.1467965

11. Lahti RA, Penttilä A. The validity of death certificates: routine validation of death certification and its effects on mortality statistics. *Forensic Sci Int* (2001) 115(1-2):15–32. doi: 10.1016/S0379-0738(00)00300-5

Conflict of Interest Statement: IO has received honoraria from Ratiopharm, consultancy fees from Camurus, and has attended a congress trip subsidized by MSD. ML is an owner and board member of Genomi Solutions Ltd, a Finnish-based bioinformatics company and has received honoraria or study grants from Sunovion Ltd, Orion Ltd, and the Finnish Medical Association. JT has participated in research projects funded by grants from Janssen-Cilag and Eli Lilly to his employing institution. JT reports lecture fees from Eli Lilly, Janssen-Cilag, Lundbeck, and Otsuka; consultancy fees from EMA (European Medicines Agency), Fimea (Finnish Medicines Agency), and Lundbeck; and grants from The Stanley Foundation and the Sigrid Jusélius Foundation.

The remaining author declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

ILKKA OJANSUU

This dissertation examined the overall mortality of Finnish forensic psychiatric patients, mortality by the cause of death, and the effect of substance use disorder on mortality. Excess mortality observed in this dissertation shows why the support and treatment of these patients is important both during and after the end of their forensic psychiatric treatment.

UNIVERSITY OF
EASTERN FINLAND

uef.fi

**PUBLICATIONS OF
THE UNIVERSITY OF EASTERN FINLAND**
Dissertations in Health Sciences

ISBN 978-952-61-3680-6
ISSN 1798-5706