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Aggressive behaviour and seclusion on closed psychiatric wards

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**Aggressive behaviour and seclusion
on closed psychiatric wards**

Paul Doedens

UNLOCK THE DOORS

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Colophon

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UNLOCK THE DOORS

Aggressive behaviour and seclusion on closed psychiatric wards

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor

aan de Universiteit van Amsterdam

op gezag van de Rector Magnificus

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CHAPTER 1

General introduction

**UNLOCK
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DOORS**

Life of patients in closed mental health institutions generally takes place outside the line of sight of the public and media. Nevertheless, occasionally patients' stories do receive a fair amount of attention. An example is the story of Wim, who died from suffocation after vomiting in the seclusion room of a mental health institution in Amsterdam (1). Another example is the story of Roelie, who died in the seclusion room of an institution for people with intellectual disabilities (2). Shocking footage of the fatal incident of Roelie (filmed with security cameras) were shown on national television in the Netherlands (3). Due to these and other incidents, public, policy makers and professionals agreed that coercive interventions, such as seclusion, are dangerous and inhumane and should be abandoned, or at least administered with the greatest possible caution. Mental health institutions acknowledged this already in 2004, which resulted in the ambition to lower the rate of seclusions with 10% each year (4). However, coercive measures have proven to be persistent and to abstain from coercion is challenging.

Internationally, the use of coercive interventions is also surrounded with controversy (5). In every country, several psychiatric inpatients died after the use of coercive measures, mostly resulting in widespread public indignation. Coercive measures have many forms, from close observation in an open area to seclusion and mechanical restraint (6). Several treatments options (i.e. admission, pharmacological treatment) are potentially coercive, but mostly used voluntarily. Seclusion and restraint are, however, coercive almost by definition. We define seclusion as "the isolation of patients in a locked room, with tamper-proof decoration and without other people present in the room" (6, 7). We define restraint as "the restriction of patients' movement with straps, belts and other equipment or by physically holding the patient" (6, 7). The use of seclusion and restraint contradicts with several international conventions such the *Universal Declaration of Human Rights* (8), the *European Convention of Human Rights* (9) and the *Principles for the protection of persons with mental illness and the improvement of mental health care* (10).

Besides international conventions, patients and professionals share the wish to abolish seclusion and restraint from mental health care. The wish of mental health professionals to stop using seclusion and restraint goes back to the 19th century. The Lincoln Lunatic Asylum was allegedly the first to stop using seclusion and restraint in daily practice (11). Their publications were the start of a polemic debate among physicians about the efficacy, safety

and necessity of seclusion and restraint, as both interventions had fierce advocates and opponents (12). More than a century later, Italy was one of the first countries to de-institutionalise mental health care by the Basaglia Law, thereby decreasing seclusion and restraint immensely (13). Today, there is still an ongoing debate around the use of seclusion and restraint, although the content has changed. Extensive scientific research that did not find any therapeutic effect of seclusion and restraint numbed the debate around efficacy almost completely (14). In addition, patients and professionals reached consensus on the threats that seclusion and restraint impose for patient safety. Several studies reported adverse events related to seclusion and restraint, ranging from patients' stress and traumatic experience to severe injuries and death (10, 15, 16). Due to these safety issues and the lack of evidence for therapeutic value, seclusion and restraint are only suitable to serve as intervention of last resort in case of immediate hazardous patient situations (16). The ambition to stop using seclusion and restraint in the Netherlands led in 2016 to the "Dolhuys-manifest", a national announcement of more than fifteen mental health institutions to ban the seclusion room before the start of 2020 (17). However, clinical practice turned out to be stubborn and this ambition was not yet met to this day (18).

Despite consensus on absence of efficacy and safety issues, seclusion and restraint are deemed as necessary to protect the safety of patients and staff members in case of dangerous behaviour of patients, especially in case of patients' aggressive behaviour (19). Aggressive behaviour is an adverse event and is the most prevalent indication for seclusion and restraint (20). Morrison (21) defined aggressive behaviour as "any verbal, nonverbal or physical behaviour that was threatening (to self, others, or property), or physical behaviour that actually did harm (to self, others, or property)". Staff members and patients of psychiatric wards are at high risk to be the victim of aggressive behaviour (22). This leads to work-related stress and burnout for staff members, traumatic experiences and deteriorated psychiatric condition for patients and financial burdens for mental health institutions (23, 24). Therefore, clinical practice faces a Catch-22 situation. Aggressive behaviour can result in dangerous situations for patients and staff members and ultimately, this can lead to the use of seclusion and restraint. However, by keeping others safe, patients who get secluded or restrained endure a harmful (and sometimes lethal) intervention.

International perspective and developments

Aggressive behaviour in the workplace (or workplace violence) is a major challenge for professionals, employers and governments globally. The Netherlands are no exception to this phenomenon; almost half of the Dutch workforce have experience with aggressive behaviour (25). Professionals in the health care sector are especially at high risk of aggressive behaviour (26). Nurses working in nursing homes, emergency departments and mental health institutions are relatively at highest risk of experiencing aggressive behaviour (27, 28). Ultimately, aggressive behaviour may lead to the use of seclusion and restraint, especially on acute psychiatric wards (29, 30). There are major differences between European countries in the frequency of application of seclusion and restraint. In addition, some countries use primarily seclusion in case of aggressive behaviour and others use restraint (31, 32). The reason for these differences are unknown, but place-bound historical reasons seem more likely than informed professional consideration. Mental health services in the Netherlands uses seclusion most of the time, while (mechanical) restraint is rare (33, 34). Therefore, we limit our research on the use of seclusion after aggressive behaviour on acute psychiatric wards.

The ambition to abolish the use seclusion from mental health care led to several quality improvement models, such as *Safewards*. *Safewards* is a model that consists of several interventions for prevention of conflict (e.g. aggressive behaviour) and containment (e.g. seclusion) (35). Personal contact and mutual understanding between nurses and patients are the key elements for most of the interventions, with names such as “Clear Mutual Expectations”, “Positive Words” and “Know Each Other” (36). After the development of *Safewards* in the United Kingdom, researchers from all over Europe translated the website into (currently) nine languages (36). Another example, developed in the United States, is the *Six Core Strategies* model (37, 38). These six strategies guide institutions to shape their policy for the reduction of seclusion and restraint, by for example leadership towards organisational change, workforce development and debriefing of coercive measures (38). Third example is a national program from the Netherlands named *High Intensive Care* (39, 40). *High Intensive Care* focusses on enhancing care for patients in crisis instead of using coercion, again based on personal contact between patients and nurses (39, 40). By

enhancing the level of care, staff members aim to prevent aggressive escalation and thereby, prevent the use of (solitary) seclusion.

Subsequently, quality of nurses and other frontline staff members, especially their ability to connect and interact with patients play a major role in the prevention of aggressive behaviour and reduction of seclusion (41). The use of seclusion is a clinical decision of the multidisciplinary team, but nursing staff are as frontline workers the main factor in the decision-making process (19). If we could improve our knowledge on the influence of nurses the incidence of aggression and the use of seclusion, we might be able to develop strategies to prevent these events from happening.

Risk of aggressive behaviour & other adverse events

The main reason for using seclusion or other coercive measures is aggressive behaviour (42-44). Aggressive behaviours on acute psychiatric wards occurs mostly during patient-staff interaction (42, 43, 45). As a result, nurses and other frontline staff members are more often victim of aggression than other healthcare staff members (43, 44). Based on the frustration-aggression theory, this seems obvious, because nurses will frequently prevent the patient from achieving its personal goal (i.e. going home or decline psychiatric treatment) (45, 46). This raises the question to which extent patients and nurses agree upon their reflection and analysis of aggressive incidents. Consequently, patients who show aggressive behaviour because of the decline of their needs might see their actions as justified, contrary to the nurses' view (47, 48). In order to investigate this phenomenon, we performed a grounded theory study on the perspectives of patients and nurses, very soon after aggressive events and their advice to prevent aggression in the future (**chapter 2**).

We consider aggressive behaviour as an adverse event in the context of psychiatric inpatient care. Aggressive behaviour and other adverse events impose a threat to the safety of patients on psychiatric wards. Though there is some research on adverse events on psychiatric wards (i.e. aggression to self or others or falls) (49, 50), most studies use small datasets or investigated a narrow range of adverse events. In order to give a broad perspective on patient safety events, we investigated predictors for adverse patient events and medical errors in a large dataset of 14 hospitals from the Pennsylvania Health Care Cost

Containment Council (**chapter 3**). Subsequently, we focussed specifically on aggressive behaviour. Because of the importance of patient-staff interaction in the incidence of aggressive behaviour, the influence of the nurse as professional and as a person cannot be underestimated. Scientific literature primarily focusses on the influence of patient characteristics on aggressive behaviour. Examples of patient characteristics frequently mentioned as predictors for aggression are young age, male gender, involuntary admission and psychotic disorders (51, 52). Scientific literature is far less conclusive about the influence of nursing team characteristics and the incidence of aggressive behaviour (53). In addition, previous studies give reason to believe that the influence of patients and nurses differ between verbal and physical aggressive behaviour (54, 55). To gain more knowledge on this subject, we analysed all verbal and physical aggressive events during two years of data collection on an acute psychiatric ward. We focussed on patient, nursing staff and shift variables, with special attention for the influence of nurses' personality traits on the incidence of aggressive behaviour (**chapter 4**).

Risk of seclusion

Seclusion is an intervention without therapeutic effect and only used as intervention of last resort in case of highly dangerous situations. However, assessment of dangerous situations is a highly subjective phenomenon. Obviously, the majority of nurses will consider situations where patients threaten people with weapons or use physical violence as dangerous. Situations with verbal aggression or violence against goods yield more discussion about the "dangerousness". Thereby, the subjective assessment of nurses influences the appraisal of the appropriateness of seclusion as intervention (56). The attitude of the nurse towards seclusion is one of the factors that influence the nurses' judgement. The extent to which nurses view seclusion as therapeutic, necessary, acceptable or harmful has major impact on their decision-making process. Laukkanen, Vehvilainen-Julkunen (19) showed that the majority nurses consider seclusion a necessary and acceptable intervention in case of dangerous events, despite the fact that the general attitude of nurses towards seclusion is increasingly negative. However, attitude may not fully explain the nurses' judgement of the appropriateness of seclusion. Characteristics of the nurse may influence their judgement and thereby, influence the risk of seclusion for their patients (19, 57-61). Several studies are available in literature, both on the attitude of nurses towards seclusion (62, 63) and on the

influence on nursing staff characteristics on seclusion (41). However, a systematic review that integrates both the theme of attitude and the theme of other characteristics is lacking in scientific literature. To assess the current state of knowledge on these topics, we describe a systematic review on the attitudes towards coercive measures and the influence of characteristics of nurses on coercive measures (**chapter 5**).

Several authors investigated the influence of nursing staff factors on the use of seclusion. These studies show many differences in study design, analysis, variables and level of detail. For instance, Bowers, Van der Merwe (56) performed a large cross-sectional study in the United Kingdom and investigated coercive measures (self-reported by the wards' nurses) and the influence of patient and staff characteristics by comparing wards. Vollema, Hollants (61) compared seclusion events with a sample of patients without seclusion during the admission. Cowman, Bjorkdahl (29) measured the use of seclusion and nursing staff characteristics every day to get a detailed picture of their influence. However, to collect data on day-to-day level imposes a serious limitation. Nurses typically work in eight or nine hour shifts on clinical wards. The composition of a nursing shift team varies every other shift, and thereby, the influence of the team on nurses differs every other shift. When investigating the influence of nursing teams on patient endpoints, it is crucial to address nursing shift teams to achieve valid outcomes. Therefore, we performed a prospective observational study on the influence of nursing shift teams on the incidence of seclusion on an acute psychiatric ward (**chapters 6 & 7**).

In scientific literature, nursing staff characteristics mostly refer to demographic characteristics (e.g. gender, age, ethnicity) and professional characteristics (e.g. level of education, work experience). However, these features might have compromised validity concerning the influence of nurses on the use of seclusion. Even though demographic and professional characteristics might be important, other variables might have greater influence on the behaviour of the nurse when interacting with other nurses and with patients. Variables such as work stress, attitude, feeling of safety or personality traits are at face value better candidates for factors that possibly influence seclusion. To measure personality traits, several models are common in clinical practice and scientific research. One of the most popular models is the Five-Factor Model (64). The Five-Factor Model consists of five basic personality traits, namely openness to experience, conscientiousness, extraversion,

agreeableness and neuroticism. To this date, no previous studies investigated personality of nurses using the Five-Factor Model for this specific purpose. Thereby, we studied personality traits of nurses in relation to seclusion, in addition to demographic and professional characteristics (**chapter 7**).

Advanced methodology in aggression research

In general, there are few studies available with detailed measurement on the use of coercive measures or the incidence of aggressive behaviour. Besides dilemma's concerning ethics and privacy when performing research with patients of which the mental competence is questionable, methodological difficulties play an important role. Research of risk factors of adverse events typically use regression techniques to estimate the influence of individual variables. Mostly, multilevel analysis (or repeated measures analysis) is necessary because of lack of independent observations. However, some research investigates the influence of nursing staff on the incidence of adverse events does not meet the minimal assumptions for multilevel regression analysis. One of the assumptions for multilevel analysis is that data has a hierarchical structure. An example of such structure is the combination of hospitals and wards. The wards of a single hospital have less mutual variance than if they were in different hospitals and thereby form a cluster. However, standard multilevel techniques cannot cope with non-hierarchical data structures. An example of a non-hierarchical data structure is cross-classification (65). Cross-classification occurs when a participant or observation is part of more than one hierarchical structure. For instance, a child is a student of a school, but also lives in a neighbourhood. Because children are not by definition in school in their own neighbourhood, there is no hierarchical structure between schools and neighbourhoods. Instead, there are two multilevel models, children-schools and children-neighbourhoods. This structure results in a phenomenon called the "school-neighbourhood effect" (66). When investigating the influence of nurses on patient endpoints, the data structure introduces a similar (although more complicated) problem. Patients deal with more than one nurse and with more than one nursing shift team, because shift team composition is variable. Thereby, nursing shift teams are clusters within the patient level. Nursing shift teams (and individual nurses) also care for more than one patient at the same time. These patients are thereby clusters within nursing shift team level. Several studies ignore these complex statistical problems in clinical research, which imposes a risk of overestimating the treatment effects

due to incorrect inference on statistical significance. Using these complex statistical techniques can result in estimates that are more accurate. To improve knowledge, decision-making and performance of this specific statistical technique, we performed a simulation study of the cross-classified multilevel model (**chapter 8**) and intended to publish the STATA code of our clinical studies in the public domain (**chapters 4 & 7**).

Outline of the thesis

In **chapter 2**, we describe the results of a qualitative study about the perspectives of patients and nurses on the cause of aggressive incidents and their suggestions towards prevention of aggressive behaviour in the future. In this study, we addressed the following research questions: 1) What is the underlying theory on the differences and similarities of patients' and nurses' view on aggressive incidents? 2) Which recommendations are provided to prevent aggressive incidents in the future?

In **chapter 3**, we describe the results of a multivariable analysis of a large, diverse sample of hospitals in Pennsylvania, USA, on predictors that influence the occurrence of adverse events and medical errors on psychiatric inpatient wards. In this study, we addressed the following research question: Which patient and hospital characteristics have influence on the occurrence of adverse events (e.g. aggressive behaviour, suicide attempts) and medical errors (e.g. medication flaws) on inpatient psychiatric wards?

In **chapter 4**, we describe the results of the analysis of the influence of patient, nursing team and shift characteristics on the incidence of aggressive events in our two-year prospective cohort study. This study addressed to following research questions: 1) Which nursing team (e.g. personality traits, gender, education), shift (e.g. patient-staff ratio) and patient characteristics (e.g. gender, diagnosis) are associated with the incidence of aggressive patient behaviour on acute psychiatric wards? 2) Do these associations differ for verbal aggression and physical aggression?

In **chapter 5**, we describe the results of a systematic review concerning attitude of nurses towards coercive measures and the influence of staff characteristics on the use of coercive measures, which addressed the following research questions: 1) What are the attitudes of psychiatric nurses towards use of coercive measures? 2) Which individual or team nursing

staff characteristics are associated with the use of coercive measures and with the attitude of nurses towards coercive measures in acute mental health services?

In **chapter 6**, we describe the results of the first five months of data collection of a prospective cohort study on the influence of nursing teams on the use of seclusion, which addressed the following research question: Which nursing staff characteristics are associated with seclusion of adult inpatients admitted to a closed psychiatric ward?

In **chapter 7**, we describe the results of the full two years of data collection of a prospective cohort study on the influence of nursing teams on the use of seclusion. This study addressed the following research question: What is the influence of nursing team characteristics (demographic, professional or psychological) and shift characteristics on the occurrence of seclusion on an acute mental health ward, while controlling for patient characteristics?

In **chapter 8**, we describe the results of a simulation study to familiarize clinical researchers with cross-classification and assist them in the decision whether the added complexity of cross-classified multilevel models (CCMM) is a price worth paying. We addressed the following research question: Given that, theoretically CCMM is the correct model to analyse cross-classified data, what is the effect of using different statistical techniques on data with a cross-classified structure due to patient and shift effects?

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Part I:

**Risk of aggression &
adverse events on
acute psychiatric wards**

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CHAPTER 2

“But I did not touch nobody!”
- Patients’ and nurses’ perspectives
and recommendations after
aggression on psychiatric wards -

A qualitative study

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Abstract

AIMS To gain a deeper understanding of the differences in patients and staff perspectives in response to aggression and to explore recommendations on prevention.

DESIGN Qualitative, grounded theory study.

METHODS We conducted semi-structured interviews with patients and nurses involved in an aggressive incident. Data collection was performed from May 2016 to March 2017.

RESULTS Thirty-one interviews were conducted concerning fifteen aggressive incidents. Patients and nurses generally showed agreement on the factual course of events, there was variation in agreement on the perceived severity. Patients' recommendations on prevention were mostly personally focussed, while nurses suggested general improvements.

CONCLUSION Patients are often capable to evaluate aggression and give recommendations on prevention shortly after the incident. Patients and nurses differ in the perceived severity of aggression. Recommendations on prevention of patients and nurses are complementary.

IMPACT What problem did the study address? Perspectives of patients and nurses differ with respect to aggression, but how is unclear. What were the main findings? Patients and nurses generally described a similar factual course of events concerning the incident; patients often perceive the severity less than nurses do. Patients are capable to give recommendations on prevention of aggressive incidents, shortly after the incident. Where and on whom will the research have impact? Factual course of events can be a common ground to start evaluating aggressive incidents and post-incident review should address the severity of incidents. Asking recommendations from patients on how to improve safety and de-escalation can lead to innovative and personal de-escalation strategies and supports patients autonomy.

Introduction

Aggressive behaviour is a worldwide problem in healthcare (1, 2). Nurses working in closed psychiatric units are at high risk for experiencing physical violence at work (3). The danger of aggression is the main reason for professionals on psychiatric wards to apply coercive measures, such as seclusion and restraint (4, 5). Coercive measures may threaten the therapeutic alliance between patients and professionals (6). The international mental health community aims to ban coercive measures from practice (7). To prevent the use of coercive measures, it is important to gain insight in perspectives of patients and staff on aggressive incidents and tailored recommendations concerning prevention are needed.

Background

Several studies evaluated the perspectives of patients after aggressive incidents (8-10). Other studies reported on perspectives and attitudes of staff members towards aggression (11). Several studies investigated experiences and perspectives of patients and staff members on aggressive incidents in general (12-17). Some found considerable consensus between patients and nurses in their perspectives (12, 13, 17). Others found major differences, especially concerning perspectives on the nature and cause of aggressive incidents (14, 15, 18). These studies lacked triangulation of different perspectives on the same incident. To our knowledge, two studies did triangulate the perspectives of patients and staff members. Omérov, Edman (19) used a questionnaire for staff members and Ilkiw-Lavalle and Grenyer (20) tested differences in categories from questionnaires, to compare the experiences of patients and staff of a specific aggressive incident. Both found several differences in perspectives concerning causes (i.e. patients perceived environmental factors important as cause for aggression, while staff focussed on the patient's illness) and potential prevention of the incident (i.e. inability of staff to identify patients' provocations for aggression). These differences are believed to influence patient-staff interaction (12-14) and may affect recommendations to prevent aggression (16). The existing literature described overall differences in perspectives and recommendations, but the nature of these differences in perspectives of the persons involved remains unclear. To use the knowledge on these differences for prevention of aggression, a more thorough understanding of the differences in perspective is crucial. Additionally, further insight into similarities and

differences between patients and nurses concerning recommendations is essential to use these recommendations effectively in the prevention of patient violence.

The study

Aims

The aim of this study is to gain deeper understanding in the differences in perspective between patients and nurses concerning a specific aggressive incident. We addressed the following research questions: 1. What is the underlying theory on the differences and similarities of patients' and nurses' view on aggressive incidents? 2. Which recommendations are provided to prevent aggressive incidents in the future?

Design

We used a grounded theory design to identify the underlying concepts to provide a theoretical explanation based on narrative data (21). This study is reported according to the Consolidated Criteria for Reporting Qualitative Studies (COREQ) (22).

Sample/Participants

A convenience sample of nurses and patients who were involved in an aggressive incident was recruited. An aggressive incident was defined as "any verbal, nonverbal or physical behaviour that was threatening (to self, others, or property), or physical behaviour that actually did harm (to self, others, or property)" (23).

Recruitment started with a presentation at the ward about the aims and procedures of our study. We aimed at including both more and less severe incidents, in order to collect data that is as rich as possible. Nurses were asked to report aggressive incidents to the researchers through email. Immediately after receiving a report, one of the authors (JV) came to the ward to approach the nurse and patient for study participation. Inclusion criteria for patients and nurses were being a participant in an aggressive incident and willing to participate in an interview. Exclusion criteria for patients were a severe language barrier, current stay in seclusion or previous participation in the current study.

The setting was a twelve-bed closed psychiatric ward for adults of a university hospital in The Netherlands that admits approximately 150 patients annually. The closed admission ward provides acute psychiatric care for patients with various diagnoses, mostly psychotic disorders and mood disorders. Reasons for admission always include (potential) danger due to the psychiatric disorder. Most of the patients (>80%) are admitted involuntary in the context of the Dutch civil Mental Health Act (24).

The ward's team consists of twenty-five registered nurses, educated on European Qualifications Framework level four (secondary vocational education) or six (bachelors' degree). Additional training in verbal de-escalation and physical restraint is part of the ward's routine training program. Verbal de-escalation is an intervention that consists of calmly managing an agitated client to prevent (further) violence (25).

During the study period, twenty-two aggressive incidents were reported. This is an underestimation of the number of aggressive incidents on the ward, probably due to under-reporting. Under-reporting of aggressive incidents is a well-known problem in healthcare (26). The authors assume that nurses only reported more severe aggressive incidents, because a relatively high number of patients in our study were secluded after the incident.

Seven eligible patients declined to participate, mostly because of lack of interest or distrust regarding audiotaping their comments. No patients were excluded because of their psychiatric condition or language barrier. None of the nurses declined to participate. This resulted in a sample of fifteen unique patients and thirteen nurses representing fifteen unique aggressive incidents, with a total of thirty-one interviews. One incident had two nurses involved who were both interviewed and three nurses were involved in more than one aggressive incident.

Data collection

Data collection was performed from May 2016 to March 2017. Semi-structured interviews were conducted in a private room at the ward to enhance confidentiality. One of the first authors (JV) performed the interviews because she was not part of the ward's treatment team. The interviews were planned short after the incident aiming to capture vivid memories from the patient while being in comparable psychiatric state as during the

incident. In case of seclusion, patients were approached shortly after termination of the seclusion episode. Planned duration of the interviews was approximately fifteen minutes, to diminish potential burden for patients. Patients who were not included or declined participation were approached by nursing staff for post-incident review, in line with regular practice.

During the interviews, a topic list was used with questions that had been developed with an experienced qualitative researcher, tested for face validity with an expert by experience and pilot tested in three interviews. The following questions were asked: *1) Can you describe the aggressive incident that you have recently been through? 2) Can you describe the response of the staff and your opinion about this response? 3) Can you give any suggestion that could have prevented the aggressive incident and/or improved the care at that time?*

The interviewer stimulated participants to give in-depth information about the factual course of events during the incident, the acts of nurses during the incident and their recommendations on prevention. Interviews were digitally audiotaped. We decided not to make field notes, because the participating patients often suffered from paranoia and making notes could induce suspicion and agitation.

Ethical considerations

This study was reviewed by the Medical Ethics Review Board of our institution, which decided that formal approval was not necessary. The Dutch Medical Research (Human Subjects) Act (WMO) states that formal ethical approval is necessary when the study meets two criteria: 1) It concerns medical/scientific research; and 2) participants are subject to procedures or are required to follow rules of behaviour (27). The primary reason that the Medical Ethics Review Board decided that our study was not considered as a study within the influence of the WMO is that we only investigated usual patient care. Debriefing aggressive incidents is considered regular clinical practice. Therefore, in our study subjects were not required to follow rules of behaviour beyond normal clinical practice. The WMO is based on international quality standards for medical research, such as the declaration of Helsinki and Good Clinical Practice.

The researchers approached eligible patients and explained the objective of the study, the goal and duration of the interview and the right to refuse and to withdraw consent at any time. Even severely unwell inpatients in mental health care can be capable of decision-making for research (28). We gave considerable attention to informing patients on the nature of the study and their rights to refuse or withdraw consent, as recommended in earlier research on obtaining informed consent from inpatients in mental health care (29). We obtained written or audiotaped informed consent from all participating patients. Information from the interview was not discussed with the patients' treatment team. Thereby, the researchers had no influence on clinical decisions. The participation of staff members was not discussed with the departments' management team or with their co-workers. The privacy of all participants was protected according to the Dutch privacy protection legislation.

Data analysis

Interviews were transcribed verbatim in MAXQDA version 12. The two first authors of this study (both PhD-students) independently analysed all transcripts after receiving additional training in performing qualitative research. This started after the first interview and was performed alongside with the data-collection. First, we carefully read the transcripts to become familiar with the data. Subsequently, during re-reading, the content was coded in-vivo and afterwards codes were clustered into concepts (coding tree available upon request). Quotes for this manuscript were selected during consensus meetings.

Regarding the perspective of patient and nurse, incidents were analysed in patient-nurse dyads. We carefully read the codes again and independently rated whether overlap of perspectives between nurse and patient was found. The first authors held several consensus meetings with the last author to discuss the concepts that were identified and the core category in the data (30). During analysis, the authors went back and forth to the data to verify emerging concepts.

Because there is a substantial body of evidence regarding recommendations on prevention of aggression (8-10, 15, 16, 31), we followed a slightly different procedure analysing this research question. Recommendations were analysed independently of specific incidents. After reading, coding and clustering the codes into concepts, three researchers (JV, PD &

LdH) discussed the content of the interviews after every 2 or 3 incidents and decided if new concepts or recommendations emerged.

Transcripts and results were not returned to the participants, because of the vulnerable patient population. For publication, Dutch quotes were translated to English by one of the authors (LLB) who was raised bilingually. Translation was as literal as possible in order to stay close to the words used by participants. This results in some grammatically incorrect sentences and in some cases in a choice of words that is somewhat erratic.

Findings

Sociodemographic variables of patients are presented in **Table 2.1**. Nurses who participated in this study were all registered nurses, six were male and seven female.

The interviews lasted from eight to twenty-five minutes and were conducted a median of three days after the incident.

Concepts

Two concepts emerged from our data regarding the perspective of patients and nurses on aggressive incidents, namely *facts* (the factual course of events of the provocation, escalation and solution of the aggressive incident) and *subjective experience*. The major difference between patients and nurses is found in the latter, particularly in the *perceived severity* of the incident. We identified perceived severity as our core category of the difference in perspectives.

The core category that emerged from our data regarding recommendations was that there were distinct *patients' recommendations* and *nurses' recommendations*. Patients gave recommendations on their own treatment, while nurses tended to give recommendations on the de-escalation of aggressive incidents in general. Furthermore, there were five subthemes emerging from patients' recommendations, namely 1) humane treatment & freedom, 2) ward routine, 3) interpersonal contact, 4) personalised de-escalation interventions and 5) shared decision making during a coercive measure. Subthemes that emerged from the nurses' recommendations were 1) pharmacological interventions, 2) timing of interventions and 3) facility related factors.

Table 2.1: Sociodemographics of the included patient sample (n=15)

Variables	n (%)
Types of aggression	
Verbal aggression	3 (20)
Physical aggression to others	3 (20)
Physical aggression to objects	9 (60)
Gender male/female	10 (67) / 5 (33)
Age, median (IQR)	28 (26-37)
Primary diagnosis	
Psychotic disorder [†]	10 (67)
Bipolar I disorder	4 (27)
Other [‡]	1 (6)
Compulsory admission	15 (100)
Concluding of incident	
Seclusion	12 (80)
Time out	3 (20)
Incidents concluding with restraint	0
Length of admission, days, median (IQR)	75 (52-180)
Number of days between incident and interview, median (range)	3 (2-13)

[†] Psychotic disorder: schizophrenia, schizoaffective, due to medical disorder. [‡] Personality disorder.

IQR=interquartile range; SD=standard deviation.

Perspectives

Factual course of events

We observed high similarity in the factual course of the aggressive incident between patients and nurses. Both described similar facts (such as place of the incident and length of the intervention) of the incident. The facts prior to the incident and in the last phase of the incident (i.e. intervention) showed most resemblance. A brief description of patients and nurses for each incident can be found in **Table 2.2**.

Table 2.2: Description of involved patients and nurses

Incident	Involved patient	Sex, native language (interview language¶)	Involved nurse(s)	Sex, native language (interview language¶)
I1	P1	Male, Dutch	N1	Male, Dutch
I2	P2	Male, Dutch	N2	Female, Dutch
I3	P3	Male, Dutch	N3	Male, Dutch
			N4	Female, Dutch
I4	P4	Male, Dutch	N5	Male, Dutch
I5	P5	Male, Italian (English)	N6	Female, Dutch
I6	P6	Male, Dutch	N7	Female, Dutch
I7	P7	Male, German (English)	N8	Female, Dutch
I8	P8	Male, Dutch	N4	Female, Dutch
I9	P9	Female, Dutch	N9	Female, Dutch
I10	P10	Male, Dutch	N10	Female, Dutch
I11	P11	Female, Surinam (Dutch)	N11	Male, Dutch
I12	P12	Female, Italian (English)	N12	Male, Dutch
I13	P13	Female, Antillean (Dutch)	N13	Female, Dutch
I14	P14	Female, Dutch	N2	Male, Dutch
I15	P15	Male, Dutch	N10	Female, Dutch

¶ Interview language is mentioned for the non-Dutch native speakers. With native speakers, interview language was Dutch

P13

<On that moment? I get angry and start screaming: I want help needed. Bring me my doctor. I want to see my doctor! >

N13

<Then we offered paracetamol and other things for the pain, ehm, she was actually really agitated and demanding and "A doctor must come now!">

Strikingly, patients remembered the course of events in a detailed manner, despite having severe psychiatric symptoms. They sometimes even remembered events in more detail than

the involved nurse did. For example, the following patient stayed in the seclusion room from Monday until Thursday.

P1

<I come inside, the police arrives, they take me in there. I went crazy, they give me an injection. Another injection, without without any ... give me an injection, I stay in there from Monday to Thursday>

N1

<And sir was taken into the seclusion room under coercion, there he is administered an intramuscular antipsychotic and a new medication policy was dictated. And sir stayed, I think, about a week in the seclusion room>

Subjective experience

The subjective experience of patients and nurses regarding the aggressive incident differed in most cases.

P12

<So, I spit on the, like I do tuff. But not on him, on the ground. And I also clean this; it is not a problem you know. Like a spit and say: 'what the, stuff like that. But I did not touch nobody.>

N12

<At that moment she started to clear her throat, seriously, I saw the spittle on her tongue, so she could spit at me. And the only thing I could do was: push her away.>

We interpreted differences in subjective experience as a difference in perceived severity of the aggressive incident. We defined perceived severity (PS) as “the subjective severity of aggressive behaviour perceived by the aggressor, victim or witness of an aggressive incident”. PS is a construct described in literature around school bullying (32), but was never included in literature on aggression in mental health care. In general, patients perceived the severity of the aggressive incident as lower than nurses did.

P5

<Yeah, they tell me that I am sexual aggressive with the people but if I took you by arm and say: 'Come on let's go'. I guess that, yeah, we are two adults and we can have some fun together without any other problems. But of course, if you say: 'No, I don't want it', and I respect you.>

N6

<It came out of nowhere actually. I entered the corridor and that gentleman comes out of his room and he rushes at me and grabs me and fondles me like this and then he said 'you are coming with me now', in English. So he wants to take me, like, to his room. So I said: 'no, you have to let go of me now. ... He says: 'yes, I am just going to have sex with you now'.>

We found several patients that challenged the appropriateness of the response of nurses to the aggressive incident. This is not surprising, based on the difference in PS. We perceived this for instance in the following two examples:

P5

<Of course my point of view is very disappointing because I don't make nothing bad and the separation room, I can tell you it is something that is truly terrible>

N6

<But yeah, still, if you inject him, you still have that the danger. ... So, you have to choose for safety so it was decided to bring him to the seclusion room for a continuous stay>

P3

< I was already tired. I was in my room, getting ready to sleep. I heard extremely loud TV, and washing-up and this and that. At half past two the TV was on, someone was doing the dishes and whatever. Yes, and then I did not snap, but I said: 'come on, I want to sleep'. And then all day he came, that tall bald guy, he came all night with his flashlight and: is he sleeping, is he sleeping. Yeah and then I woke up again.... Well and then I went crazy, and they came with

30. ... Yes, no, but yes no but they came to the seclusion room. I sat there for a while, three, four hours and then I could go back. But the way it happened, that is just ridiculous.>

N3

<I suggested....: go to sleep and, as for us, take medication when necessary. That will help you, it is really hard on you to be here like this right now. He refused that, over time. He was insulting in his reactions, threatening: 'well, you can go get some of those big Ajax [well-known Dutch football team] guys, they'll just smash the door', those were the kind of things that were said. Towards [female nurse], he was sexually disinhibited, openly horny, to put it like that. He did go to his room for a while, and then he woke up again. ... And, over time, when he started to bang on the door more, I pressed the alarm. Of course, others had already been notified about the situation. Security again, who also responded to the alarm, at that moment no less than three security guards, so six people on staff. At that moment in time, we had already umm decided to go give an injection in the seclusion room.>

Recommendations

Patients' recommendations

Patients often mentioned personal de-escalation techniques that were only suitable for themselves, such as music (P6 "Playing the cello calms me down") and sports (P6 "I need sports, I need some activities, and if I have my activities I am relaxed"). This concept is referred to as "meaningful daily activities". Some patients mentioned personal de-escalation interventions that were not realistic on the ward, but also gave usable alternatives (P13 "I would like them to build a pool there. You know why? If you are aggressive, you are warm. You must cold water there. If I am aggressive, I go straight to my room and shower. With that cold water I stand like tsjoeh"). Some patients gave recommendations that seem to be highly affected by psychiatric symptoms, especially when patients suffer from paranoia and anxiety, such as a patient that assumed (wrongly) the staff had "paralyzers" (P4 "You have paralyzers. You could have used them when he had Anthrax. You could have paralyzed him instead of inject him"). Patients frequently expressed their wish for more humanity (P12 "Be humane. Think and think one moment, maybe she is angry for this so let's solve her problem") and freedom (P1 "I want to have my freedom, even a bit. That is what I want to

have”) during involuntary admission. This subtheme emerged especially with patients by who the incident resulted in coercive measures (P5 “*You can’t give medicine if I don’t want it, it is a truly big violence and it’s also against my human rights*”). Another subtheme was interpersonal contact as a method for de-escalation. Some patients felt like nurses used coercion too fast and believed that talking would have helped to de-escalate the incident (P12 “*When I say something, say something back to me. But don’t grab me*”).

Some aggressive incidents ended with staff using coercive measures. During these measures, the patient’s autonomy is diminished. Patients advised to respect their autonomy as much as possible, even in the context of coercive measures. Patients expressed the need to take part in the decision of using coercive measure, for example how it is conducted and how long it must last (P9 “*The main thing is that you have to take someone out of seclusion as soon as possible, when that person has calmed down again and has come to his senses*”) or the use of own clothes for more privacy during seclusion (P13 “*And if maybe I don’t want to wear that dress. Everybody is looking because you have that mirror, and behind those people are standing there to look at you and there is a camera too*”).

Ward routine can be described by the daily practice which patients encounter, which is a result of the organisational structure of the hospital. Examples like ward rules and changes in surroundings were mentioned as influential for aggressive incidents. Patients also gave recommendations on how to change ward routines (P14 “*I think I went to several rooms, which made me even more confused*”).

During the interviews, it was clear that patients were able to give usable recommendations for the prevention of aggressive incidents. However, it seemed important that the interviewer took time to listen and ask comprehensive questions to patients. Due to (sometimes) highly incoherent language of patients, time was needed to gain valuable recommendations. Two patients could not provide coherent or feasible recommendations, from the perspective of the authors.

Nurses’ recommendations

Nurses frequently advised the use of medication to prevent aggressive incidents. The rationale is that pharmacological intervention, even pro re nata (PRN) or forced medication,

is less coercive than seclusion or restraint. Adequate timing of interventions is critical for de-escalating aggressive incidents (N10 *"So, I don't know if the shift before me, the evening shift, might have noticed and could have given medication earlier or something"*).

The recommendations of nurses around the timing of interventions is mostly to start earlier with PRN-medication or to make contact before the situations escalates. Most nurses who give recommendations on timing are not sure whether this could have de-escalated the aggressive incident (N9 *"To get her out of the garden earlier. Yes. But I don't think it would have caused less aggression"*).

Some nurses gave the recommendation related to the facility, such as availability of secured rooms on the ward (other than the seclusion room) and new development of a high intensive care unit (HIC) (33), in which the ward will contain separate rooms for one-on-one patient care (N5 *"...in a future HIC we can go into a separate room, then your social contribution will increase. You can offer more"*).

Discussion

Our main finding is that most patients and nurses described similar facts of aggressive incidents, but differences in the perceived severity. An intervention to respond to aggressive incidents is chosen based on several aspects, among which the severity of the incident. Differences in the interpretation of the severity are likely to result into differences in the interpretation of the appropriateness of the response of nursing staff to the incident. This finding answers our first research question and adds to the literature that patients were more likely to find interventions used after aggressive incidents excessive (34, 35).

Severity is found to be a subjective construct, which can highly differ between patients and staff. Most patients perceived a lower severity of aggression than nurses did. This finding is new in comparison to previous studies that triangulated around the same incident (19, 20). A study into the perception of the social environment at acute psychiatric inpatients wards explained observed differences by contradictory opinions of patients and nurses concerning high staff control and high autonomy (36). The authors explained the difference in staff control by suggesting that staff tend to underestimate the extent to which they use limiting and controlling measures towards patients. Differences in perception of the severity of an

incident might have implications for future therapeutic alliance between patient and nurse (6). For example, patients could experience the nurses' intervention as disproportionate as they wish to maintain their autonomy.

Although many studies have been performed to reduce the use of coercive measures in psychiatric wards (37), coercive measures still occur. Our study shows that exploring the perceived severity of coercive measures might be a starting point to restore the contact with the patient. Subsequently, discussing differences in perspective may improve the therapeutic alliance after an aggressive incident.

Regarding recommendations, one new concept emerged namely personalised de-escalation interventions. This study adds an in-depth evaluation of the exact difference in perspectives of patients and nurses after aggressive incidents. Furthermore, it suggests that it is valuable to explore differences in perspectives, in particular perceived severity, after aggressive incidents and ask both parties for recommendations on improvement of care. We found that most inpatients on a closed psychiatric ward were capable and willing to give recommendations regarding safety and de-escalation. Examples of types of recommendations are *meaningful daily activities, humane treatment and involvement of patients in decision-making around coercive measures*. These findings are in line with previous studies (8-10, 15, 20, 31). Similar to previous research, substantial difference between patients and nurses in concepts of recommendations emerged (16). Earlier research showed that evaluation of an aggressive incident is possible within two to seven days after the incident (10). Our study is in line with the finding that it is useful to interview both patients and nurses shortly after an incident (20). The benefits of interviewing shortly after an incident are that complementary recommendations are yielded and can be applied directly. Most of the recommendations of patients were highly personal and not covered by nurses. It is plausible that the validity of patients' recommendations obtained in our study is substantial, because patients were asked while they were in a comparable psychopathological state as during the incident.

Limitations

This is, to our knowledge, the first qualitative study that evaluated perspectives about a specific aggressive incident shortly after the incident by comparing perspectives of patients

and nurses. Behaviourally disturbed patients who are involuntarily admitted are generally difficult to include in research. They often refuse consent or a lack of decisional capacity to give informed consent is assumed (38, 39). Our results show that, although suffering from a severe mental condition, the majority of such patients are willing and able to participate in a qualitative study.

Some limitations need to be considered while interpreting the results. Since it was a mono-centre study, unique characteristics may have influenced perspectives of participants. The interviews were performed a median of three days after the incident, but two of the interviews were performed substantially later (nine and thirteen days after the incident). All patients were admitted when the interviews were conducted. Therefore, social desirability influencing their answers or recommendations should be considered as a potential limitation.

During the study, preparations were performed to adapt to a high intensive care model (33) and this may have influenced perception of nurses. Further, because this study evaluated mostly severe incidents, it is possible that this influenced the participants in their perspective and recommendations. Evaluation of minor incidents needs further research.

Conclusion

The perspective of patients is essential for improving quality and safety of care (40). However, providing care that is respectful and responsive to individual patient preferences can be challenging in case of involuntary admission (40). This study shows that incorporating perspectives of psychiatric inpatients who act aggressively, seems feasible and may be useful to improve quality and safety. A previous study reported that staff had more opportunities to debrief than patients (20). We recommend, in line with previous research, to evaluate aggressive incidents at closed psychiatric wards with patients and staff (15, 20, 41, 42). Our findings of a common ground in all incidents (factual course of events), could serve as a starting point for debriefing. We argue that perceived severity of aggression and the decision-making process leading to interventions are important concepts to discuss with patients and staff.

To compare different views, we recommend that debriefing should be held by independent staff members. Since the recommendations of patients and nurses are repeatedly found to be complementary, it is advisable to debrief both (16). Regarding the theoretical method of debriefing, previous studies in other settings showed that technical debriefing (i.e. not focussing on feelings but on facts) improve the outcome of patients after psychological trauma (43). Rapid quality cycles can be used to enhance and evaluate implementation of debriefing into practice (44). Patients and staff members should collaborate in identifying strategies to prevent dangerous situations in the future, to reduce the chance of using coercive measures (45). An example is to capture patients' personal crisis management strategies in a shared crisis management plan. Patient safety plans might provide a framework to put this into practice (46). When debriefing takes place shortly after an incident, a sense of control and autonomy could be restored.

Ultimately, the evaluation of past aggression might prevent new aggressive incidents, thereby prevent the use of coercive measures and contribute to making the psychiatric inpatient unit a safe place for everyone.

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CHAPTER 3

Predictors of adverse events and medical errors in adult inpatients of psychiatric units of acute care general hospitals

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Abstract

OBJECTIVE The aim of this study was to identify factors associated with the occurrence of adverse events (AEs) or medical errors (MEs) during inpatient psychiatric hospitalisations.

METHODS A full-probability random sample of 4,371 charts from 14 inpatient psychiatric units at acute care general hospitals in Pennsylvania were reviewed in a two-stage process that comprised screening and flagging by nurses followed by review by psychiatrists. AE and ME rates were calculated overall and then stratified by patient and hospital factors. Unadjusted and adjusted logistic regression models examined predictors of AEs and MEs.

RESULTS An AE was identified in 14.5% of hospitalisations (95% confidence interval [CI]=11.7–17.9), and an ME was identified in 9.0% (CI=7.5–11.0). In adjusted analyses, patients with a longer length of stay and older patients had higher odds of experiencing an AE or an ME. Patients ages 31–42 (compared with ages 18–30), with commercial insurance (compared with Medicare or Medicaid or uninsured), or treated at high-volume hospitals (compared with low, medium, or very high) had lower odds of an AE. Patients age 54 or older (compared with ages 18–30), admitted during the weekend, admitted to rural hospitals (compared with urban), or treated at very-high-volume hospitals (compared with high) were more likely to experience an ME.

CONCLUSIONS This study provides insight into factors that put patients and hospitals at increased risk of patient safety events. This information can be used to tailor improvement strategies that enhance the safety of patients treated on general hospital psychiatric units.

Introduction

Over seventeen years have passed since the publication of the ground-breaking patient safety report 'To err is human' (1), which called international attention to the issue of adverse events (AEs) and medical errors (MEs) occurring in the care of hospitalised patients. AEs are defined as "the negative unintended consequences of clinical care that led to injury, impairment, or other harm" (2, 3). MEs are defined as "the commission or an omission of clinical care with potentially negative consequences for a patient that would have been judged wrong by skilled and knowledgeable peers at the time they occurred, regardless of whether or not they caused harm" (4). Since that time, patient safety research has guided the development of important interventions to prevent MEs and lower the incidence of AEs in general medical and surgical care (5-14). Knowledge about these critical patient-safety events, however, is notably scarce for mental health care because major studies on the topic have systematically excluded patients receiving psychiatric care in acute care general hospitals. This lack of information about inpatient mental health care has hindered the extension and adaptation of patient safety lessons learned in general medicine.

There has been some research on the incidence of specific types of AEs and MEs in mental health care. For example, patient suicide and falls in inpatient psychiatry have been studied (15, 16). However, these events are often studied in small samples, without tested methodology, and in isolation (i.e. absent a broader spectrum of inpatient psychiatric patient safety events). One large, national study has systematically examined the incidence, nature and preventability of patient safety events in inpatient psychiatric hospital settings (17). That study of more than 8,000 discharged patients found that one out of five patients receiving care on an inpatient psychiatric unit experienced an AE or ME and that 56.6% of all events were characterised as preventable. Although the study provided important data about patient safety rates, it was conducted only at Veterans Health Administration (VHA) hospitals that deliver care to a very specialised segment of the population, and it did not examine any of the patient and hospital factors associated with a higher risk of patient safety events. Identifying potential risk factors could inform targeted efforts to reduce the incidence of these events.

Community-based acute care general hospitals are the primary service system for inpatient psychiatric care. Each year there are more than one million discharges from inpatient psychiatric units in the United States, and approximately half of these discharges are from acute care non-federal general hospitals (18). The other half are from state mental hospitals, freestanding psychiatric hospitals, and VHA hospitals – all of which represent different patient populations and systems of care. Given that acute care general hospitals are the most common providers of inpatient psychiatric care, the wide variability in the structural characteristics of general hospital settings, as well as the demographic and clinical characteristics of the patients they care for, studying AEs and MEs in this heterogeneous clinical care environment is integral to understanding the broad context in which they occur. The study reported here examined MEs and AEs in inpatient psychiatric settings at general hospitals in a large, diverse sample of hospitals in Pennsylvania, as well as the patient and hospital factors that influence their occurrence.

Methods

Study sample

This study included medical records of patients discharged from psychiatric inpatient units at 14 acute care general hospitals in Pennsylvania during 2010. The Pennsylvania Health Care Cost Containment Council (PHC4) provided a dataset from which a stratified random sample of inpatients from psychiatric units in general hospital settings was drawn. The PHC4 data included detailed information about patient demographic and clinical characteristics (e.g. diagnosis and procedure codes, length of stay and hospital information) for all hospital discharges in the state. From these data, a random sample of 19 general hospitals was selected stratified by teaching status and hospital location (urban/rural) with probabilities proportional to each hospital's number of discharges. Next, a subsample of approximately 300 patient discharges was drawn from each selected hospital with probabilities inversely proportional to the size of the hospital. Long-term admissions with a length of stay longer than 90 days were excluded from the sample. Our total sample included 14 inpatient psychiatric units because five hospitals declined to participate, representing a 74% recruitment rate. There were no significant differences between the included and excluded hospitals on their teaching status, urban/rural location, or size. Discharges from the

responding hospitals were weighted to account for non-response and to be representative of all discharges from psychiatric units at Pennsylvania acute care general hospitals.

Design and procedure

We conducted a retrospective cross-sectional chart review with two stages: nurses trained as medical record administrators (MRAs) screened and “flagged” the random sample of medical records within each hospital for potential patient safety events; then trained physician reviewers evaluated “flagged” charts for harm, error and preventability. We developed training manuals and instrumentation to implement both tiers of the study based on the methodology used in the landmark patient safety studies (2, 19). Then we recruited 11 MRAs across the state to review medical records from each study hospital. After extensive training, the teams of MRAs reviewed 4,371 of the 4,401 medical records (99.3%) as several charts were unavailable or unable to be located. The MRAs flagged all charts that had a potential patient safety event so that physician reviewers could examine each event for the presence or absence of harm, error, and preventability. Each medical record was carefully evaluated using information in admission and discharge notes, clinical notes, nursing notes, progress notes, physician orders, and medication administration records. We recruited and implemented our rigorous training process with 12 physicians across the state. Throughout the study, reviewers examined an overlap of 10% of the sampled charts and these were used as training files during weekly calls to maintain reliability. Our study team of reviewers abstracted data from the medical records of all hospitals in the sample, with the exception of one hospital, which stipulated that only their employees could have access to the data. For that hospital, we trained a separate team of nurse and physician reviewers in the study methods. None of the reviewers had treated the patients whose records they reviewed.

Outcome measures

Patient safety events were categorized as dichotomous outcomes for the occurrence of adverse events (AE) or medical errors (ME). The following events were categorized as AEs: adverse drug event (ADE), self-harm or injury, assault, sexual contact, patient fall and other adverse events. MEs included any mention in the chart of medication errors, elopement, possession of contraband and other non-medication errors. Detailed definitions of these

events have been included as an appendix (**Online supplement 3.1**) and described elsewhere (17).

Predictors

For each discharge, we examined patient demographic and clinical factors, as well as characteristics of the hospital from where they were discharged. We investigated data on gender (male, female), age (18-30, 31-42, 43-53, 54+) and race (white, non-white). Clinical factors included admission day (weekday vs weekend), length of stay (1-3, 4-6, 7-9, 10+ days), insurance status (uninsured, commercial or Medicaid/Medicare). The ICD-9 coding system was used to categorize principal diagnosis, which included psychosis (295, 297, 298), mood disorders (296) and other diagnoses (all other codes). Suicidal ideation (V62.84) or suicide attempts (E950-E959) were identified using all available diagnosis codes on the discharge claim. Drug use was categorized as continuous (303.01, 303.91 304.21-304-.91, 305.01), unspecified or episodic (303.00, 303.90, 304.20-304.90, 305.20, and 303.02, 303.92, 304.22-304.92, 305.02), or none/in remission (303.03 303.93, 304.23-304.93, 305.03). Hospital-level factors included teaching status (teaching, non-teaching), urbanity (urban or rural), and low, medium, high or very high hospital volume based on annual admissions (0-800, 801-1060, 1061-1280, 1281+ respectively). Stratification of the continuous variables (age, length of stay in days and number of admissions per year) was based on the median and interquartile range.

Analysis

First, we used chi-squares to compare the demographic, clinical, and hospital factors between patients with and without an AE or ME. Second, we calculated the proportion of discharges containing an AE or ME, both overall and separately by each type of event. We then conducted unadjusted and adjusted logistic regression analyses to assess the strength of the relationship between the patient and hospital factors and the AE or ME. Odds ratios were adjusted for all demographic, clinical, and hospital factors and we considered predictors in the adjusted analyses statistically significant at a significance level of <0.05 (2-tailed). Finally, we present box-and-whisker plots to describe the distribution of unadjusted hospital AE and ME rates using STATA version 14.0. Analyses were performed using Complex

Samples analysis in SPSS (IBM Corp, Armonk, NY, USA) version 24, which accommodated the study designs two-stage proportional sampling and its weighting.

Results

Of the 4371 discharges reviewed, 48% were male and 52% were female, with a mean age of 43.5±16.9 years and a mean length of stay of 8.3±8.5 days. We found no significant differences between the included and excluded hospitals on the hospital-level variables (teaching status, urban/rural, etc.). Patient discharges containing an AE were more likely to be older and have a longer length of stay, but were less likely to be associated with suicidality, drug dependency or being uninsured. We found similar associations when analysing patient discharges with an ME (**Table 3.1**). Overall, AEs occurred during 14.5% of all hospitalisations (**Table 3.2**). In 35% of all hospitalisations with an AE, an ME was also identified. The most commonly identified AEs were adverse drug events (9.3% of all hospitalisations) and falls (3.9% of all hospitalisations). An ME was identified during 9.0% of all hospitalisations, and medication errors were the most common type (5.7%). In 57% of the hospitalisations with an ME, an AE also occurred.

Table 3.3 presents the adjusted and unadjusted logistic regression results for patient and hospital factors as predictors of an AE. In the unadjusted model, several variables were significantly associated with a patient's increased odds of experiencing an AE: older age (54+); longer stay (four or more days); psychosis as a principal diagnosis (compared with other); absence of suicidality or drug dependency (compared to unspecified or episodic use or continuous use); insurance with Medicare or Medicaid (compared with commercial insurance or uninsured); and low, medium or very high volume hospitals (compared with high). After adjustment for all other variables, the variables of age (p -value=0.031), length of stay (p -value<0.001), insurance status (p -value=0.029) and number of admissions per year (p -value<0.001) were significantly associated with a patient's odds of experiencing an AE. Specifically, hospitalisation of four or more days (highest odds for 10+ days; AOR=11.87) was associated with an increased odds of an AE (highest odds for 10 or more days; adjusted odds ratio [AOR]=11.87), and patients ages 31-42 had lower odds of an AE during hospitalisation (AOR=0.71) compared with the youngest age group (18-30). Patients seen in low, medium or very high volume hospitals were more likely to have an AE than high volume hospitals (i.e.

1061-1280 admissions per year). Compared with patients insured with Medicaid or Medicare, those with commercial insurance showed a lower odds of an AE (AOR= 0.78). When MEs were included in the adjusted model for AEs, the association was highly significant (AOR=9.07, 95% confidence interval=6.14–13.38).

Table 3.1: Characteristics of 4,371 hospitalisations in inpatient psychiatric units at acute care general hospitals, by presence or absence of an adverse event or medical error^a

Variable	Adverse event (%)			Medical error (%)		
	Absent (N=3,752)	Present (N=619)	p	Absent (N=3,981)	Present (N=390)	p
Patient level						
Gender			.108			.077
Female	52.0	56.2		52.0	58.7	
Male	48.0	43.8		48.0	41.3	
Race			.300			.187
White	76.3	79.3		76.3	81.5	
Nonwhite	23.7	20.7		23.7	18.5	
Age			.001			<.001
18–30	26.6	20.3		26.3	19.4	
31–42	24.7	15.5		24.1	16.0	
43–53	25.3	20.9		24.9	22.6	
≥54	23.4	43.3		24.8	42.0	
Length of stay (days)			<.001			<.001
1–3	28.0	6.3		26.2	11.4	
4–6	34.2	16.4		32.7	20.0	
7–9	17.7	20.7		18.2	17.3	
≥10	20.1	56.6		22.8	51.3	
Admission day			.086			.238
Weekday	78.4	81.2		79.0	76.7	
Weekend	21.6	18.8		21.0	23.3	

Table 3.1 Continued

Principal diagnosis ^b			.068			.122
Mood	58.3	58.2		58.6	55.3	
Psychosis	22.2	26.7		22.3	28.3	
Other	19.5	15.1		19.1	16.5	
Suicidality ^c			.001			.036
Yes	15.5	9.9		84.9	89.6	
No	84.5	90.1		15.1	10.4	
Drug dependence ^d			.001			.002
Continuous	8.6	4.9		8.4	4.1	
Unspecified or episodic	23.3	15.6		22.6	17.2	
No or in remission	68.2	79.5		68.9	78.7	
Insurance status			.008			.010
Uninsured	8.2	5.6		8.2	4.5	
Commercial	40.5	31.3		39.9	32.3	
Medicaid or Medicare	51.2	63.1		51.9	63.2	
Hospital level						
Teaching status			.064			.599
Yes	54.2	45.0		53.1	50.4	
No	45.8	55.0		46.9	49.6	
Urbanity			.729			.478
Rural	18.1	17.2		17.8	19.2	
Urban	81.9	82.8		82.2	80.8	
Admissions per year			.058			.087
Low (0–800)	29.6	32.2		29.6	33.4	
Medium (801–1,060)	29.7	37.6		31.0	29.8	
High (1,061–1,280)	22.3	14.9		21.9	13.8	
Very high (≥1,281)	18.4	15.3		17.5	22.9	

^aAll analyses were performed with complex samples analysis, and thus the results are presented as percentages. ^b/ICD–9 codes:

mood, 296; psychosis, 295, 297, and 298; other, all other codes. ^c/ICD–9 codes: suicidal ideation, V62.84; attempt, E950–E959.

^d/ICD–9 codes for drug use: continuous, 303.01, 303.91, 304.21–304.91, and 305.01; unspecified or episodic, 303.00, 303.90, 304.20–304.90, and 305.20 or 303.02, 303.92, 304.22–304.92, and 305.02; in remission, 303.03, 303.93, 304.23–304.93, and 305.03

Table 3.4 presents potential predictors of MEs in the adjusted and unadjusted logistic regression models. In the unadjusted model, older age (54 years and older), longer length of stay (more than six days), insurance with Medicaid or Medicare (compared with commercial insurance or uninsured), and an absence of drug dependence or suicidality were significantly associated with an increased odds of an ME.

Table 3.2: Rates of adverse events and medical errors during 4,371 hospitalisations in inpatient psychiatric units at acute care general hospitals

Event	Hospitalisation		95% CI
	N	%	
Any adverse event	619	14.5	11.7–17.9
Any adverse drug event	398	9.3	7.1–12.2
Any patient fall	160	3.9	3.2–4.8
Any other adverse event	65	1.5	.9–2.4
Any patient assault	56	1.2	.91–6
Any patient sexual contact	42	.9	.7–1.2
Any patient self-harm or injury	27	.6	.3–1.1
Any medical error	390	9.0	7.5–11.0
Any medication error	249	5.7	4.3–7.5
Any nondrug errors	120	2.8	2.2–3.6
Any contraband ^a	64	1.5	1.1–2.0
Any elopement ^b	7	.2	.1–.4

^aElopement and contraband are errors by proxy.

In the adjusted model, age (p-value=0.006), length of stay (p-value<0.001), admission day of the week (p-value=0.030), urbanity (p-value<0.001) and number of admissions per year (p-value=0.005) showed significant associations with an ME. Older age (54 years and older), longer length of stay (more than 6 days) and admission during the weekend were associated with increased odds of an ME. In addition, the odds of an ME during hospitalisation were higher for patients seen in rural hospitals (AOR=1.45) or in very high volume hospitals (AOR=2.23) (compared with very high-volume hospitals).

Table 3.3: Association between patient- and hospital-level factors and any adverse event during 4,371 hospitalisations in inpatient psychiatric units at acute care general hospitals

Variable	Hospitalisation with adverse event		Unadjusted analysis		Adjusted analysis ^a	
	%	95% CI	OR	95% CI	OR	95% CI
Patient-level factor						
Gender						
Female	15.5	12.2–19.6	1.19	.96–1.47	.99	.81–1.20
Male (reference)	13.4	10.8–16.6				
Race						
White	14.9	11.8–18.7	1.19	.84–1.69	1.01	.74–1.38
Nonwhite (reference)	12.8	9.6–17.0				
Age						
18–30 (reference)	11.5	9.3–14.1				
31–42	9.6	8.0–11.6	.82	.66–1.02	.71	.54–.93
43–53	12.3	9.5–15.8	1.08	.82–1.43	.82	.60–1.13
≥54	23.9	16.6–33.2	2.42	1.44–4.07	1.21	.79–1.88
Length of stay (days)						
1–3 (reference)	3.7	2.3–5.7				
4–6	7.5	5.4–10.5	2.14	1.24–3.72	2.12	1.11–4.04
7–9	16.6	13.2–20.6	5.22	3.38–8.09	5.07	3.05–8.42
≥10	32.4	25.5–40.1	12.58	8.38–18.89	11.87	7.33–19.21
Admission day						
Weekday (reference)	14.7	11.5–18.5				
Weekend	12.7	9.4–16.9	.84	.69–1.03	.95	.79–1.14
Principal diagnosis ^b						
Mood	14.5	12.1–17.3	1.29	.87–1.90	1.24	.91–1.67
Psychosis	17.0	12.5–22.6	1.55	1.13–2.13	.99	.72–1.37
Other (reference)	11.7	7.8–17.2				

Table 3.3 Continued

Suicidality ^c						
Yes	9.8	8.3–11.5	.60	.46–.78	.84	.57–1.25
No (reference)	14.5	12.1–19.3				
Drug dependence ^d						
Continuous	8.9	6.4–12.2	.49	.36–.67	.94	.64–1.36
Unspecified or episodic	10.2	8.0–13.0	.58	.39–.85	.75	.58–.98
No or in remission (reference)	16.5	12.8–21.2				
Insurance status						
Uninsured	10.2	7.2–14.1	.55	.34–.89	.79	.59–1.06
Commercial	11.4	10.2–12.7	.63	.44–.89	.78	.61–.99
Medicaid or Medicare (reference)	17.0	12.0–23.6				
Hospital-level factor						
Teaching status						
Yes	12.4	10.2–14.9	.69	.46–1.03	.96	.64–1.45
No (reference)	17.0	12.8–22.2				
Urbanity						
Rural	13.9	11.3–17.0	.94	.64–1.37	1.06	.73–1.54
Urban (reference)	14.7	11.3–18.8				
Admissions per year						
Low (0–800)	15.6	13.2–18.3	1.63	1.05–2.53	1.90	1.47–2.45
Medium (801–1,060)	17.7	12.0–25.3	1.90	1.04–3.46	2.10	1.48–2.99
High (1,061–1,280) (reference)	10.2	7.1–14.4				
Very high ($\geq 1,281$)	12.4	11.4–13.4	1.25	.83–1.87	1.36	1.01–1.84

^aAdjusted for all patient-level and hospital-level factors. ^bICD–9 codes: mood, 296; psychosis, 295, 297, and 298; other, all other codes.

^cICD–9 codes: suicidal ideation, V62.84; attempt, E950–E959. ^dICD–9 codes for drug use: continuous, 303.01, 303.91, 304.21–304.91, and 305.01; unspecified or episodic, 303.00, 303.90, 304.20–304.90, and 305.20, or 303.02, 303.92, 304.22–304.92, and 305.02; in remission, 303.03, 303.93, 304.23–304.93, and 305.03

Table 3.4: Association between patient- and hospital-level factors and any medical error during 4,371 hospitalisations in inpatient psychiatric units at acute care general hospitals

Variable	Hospitalisation with medical error		Unadjusted analysis		Adjusted analysis ^a	
	%	95% CI	OR	95% CI	OR	95% CI
Patient-level factor						
Gender						
Female	10.0	8.2–12.2	1.32	.97–1.79	1.29	.89–1.87
Male (reference)	7.8	5.8–10.5				
Race						
White	9.5	7.6–11.7	1.37	.84–2.23	1.46	.91–2.34
Nonwhite (reference)	7.1	4.8–10.4				
Age						
18–30 (reference)	6.8	5.5–8.4				
31–42	6.2	4.4–8.6	.90	.65–1.25	.74	.52–1.07
43–53	8.2	6.3–10.6	1.23	.89–1.70	1.02	.71–1.47
≥54	14.4	10.8–18.9	2.30	1.69–3.12	1.32	1.04–1.67
Length of stay (days)						
1–3 (reference)	4.1	2.8–6.0				
4–6	5.7	4.4–7.4	1.41	.96–2.06	1.39	.89–2.15
7–9	8.6	6.0–12.0	2.19	1.19–4.03	2.41	1.35–4.32
≥10	18.2	13.5–24.0	5.17	3.57–7.49	4.78	3.35–6.81
Admission day						
Weekday (reference)	8.5	6.9–10.5				
Weekend	9.7	6.9–13.3	1.15	.90–1.46	1.29	1.00–1.67
Principal diagnosis ^b						
Mood	8.5	7.0–10.4	1.09	.70–1.71	1.11	.72–1.72
Psychosis	11.1	8.0–15.3	1.46	.90–2.36	1.21	.70–2.10
Other (reference)	7.9	5.2–11.7				

Table 3.4 Continued

Suicidality ^c						
Yes	6.4	4.8–8.5	.65	.44–.97	1.03	.60–1.77
No (reference)	9.4	7.8–11.7				
Drug dependence ^d						
Continuous	4.6	3.0–7.1	.43	.29–.64	.80	.50–1.28
Unspecified or episodic	7.0	5.1–9.5	.66	.47–.95	.91	.66–1.25
No or in remission (reference)	10.1	8.2–12.5				
Insurance status						
Uninsured	5.1	2.6–10.0	.46	.23–.93	.51	.17–1.51
Commercial	7.3	5.8–9.1	.67	.48–.93	.78	.59–1.03
Medicaid or Medicare (reference)	10.5	7.7–14.2				
Hospital-level factor						
Teaching status						
Yes	8.6	6.0–12.1	.90	.58–1.39	1.14	.84–1.57
No (reference)	9.5	7.8–11.4				
Urbanity						
Rural	9.6	9.4–9.9	1.10	.83–1.45	1.45	1.19–1.75
Urban (reference)	8.9	6.9–11.3				
Admissions per year						
Low (0–800)	10.0	9.4–10.7	1.79	.99–3.24	1.60	.96–2.67
Medium (801–1,060)	8.7	6.4–11.6	1.53	.78–3.00	1.51	.93–2.48
High (1,061–1,280) (reference)	5.9	3.3–10.1				
Very high ($\geq 1,281$)	11.5	7.7–16.7	2.08	.99–4.34	2.23	1.19–4.19

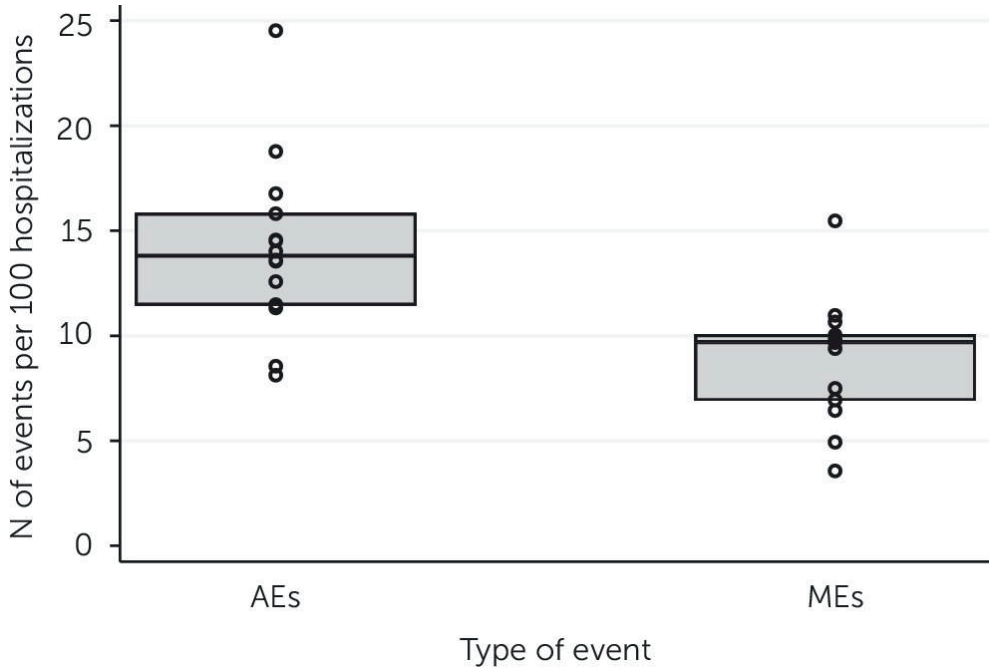
^aAdjusted for all patient-level and hospital-level factors. ^bICD–9 codes: mood, 296; psychosis, 295, 297, and 298; other, all other codes.

^cICD–9 codes: suicidal ideation, V62.84; attempt, E950–E959. ^dICD–9 codes for drug use: continuous, 303.01, 303.91, 304.21–304.91, and 305.01; unspecified or episodic, 303.00, 303.90, 304.20–304.90, and 305.20 or 303.02, 303.92, 304.22–304.92, and 305.02; in remission, 303.03, 303.93, 304.23–304.93, and 305.03

Figure 3.1 shows the distribution of facility rates of any AE or ME per 100 admissions for all included acute care general hospitals. The mean hospital rate of AEs per 100 admissions was

14.15 (range 8.12-24.52), and the mean hospital rate of MEs per 1000 admissions for study hospitals was 8.94 (range 3.57-15.48).

Figure 3.1: Adverse events (AEs) and medical errors (MEs) during 4,371 hospitalisations in inpatient psychiatric units at 14 acute care general hospitals in 2010^a



^aThe dark line represents the median. The bottom of the box indicates the 25th percentile, and the top of the box represents the 75th percentile.

Discussion

By identifying patient- and hospital- level factors that were significantly associated with the odds of an AE or an ME, this study has laid a foundation for further understanding and preventing safety events for patients receiving care in psychiatric units at acute care general hospitals. The findings also help us identify hospital system vulnerabilities that can be targeted for patient safety improvements.

Patient-level factors, including longer length of stay, older patient age, admission during the weekend and Medicaid or Medicare insurance compared with commercial insurance status were associated with higher risk of AE or ME. These findings align with prior research in

general hospital units, which has also found that longer length of stay, older patient age, and weekend admission are significantly associated with increased odds of experiencing an AE or ME (20, 21). Length of stay likely increases odds of AE and ME because of a patient's longer exposure to health care (20). However, it is also possible that a longer length of stay might be a proxy for greater severity of illness since sicker patients often require more intensive and, consequently, lengthy treatment. Thus, identifying patients who may experience longer stays (e.g. those that have prior involuntary commitments) and implementing additional safety protocols for these high-risk patients, such as more intensive monitoring and continual assessment, could reduce their likelihood of experiencing an AE or ME. Suicidal patients had shorter lengths of stay; after controlling for amount of time spent in the hospital, suicidality was no longer associated with an AE or ME. Even though patient age is not modifiable, it is useful to know that elderly patients may be at especially high risk of iatrogenic exposure on the psychiatric unit. This finding may prompt exploration of targeted strategies that enhance safety for these high-risk patient populations. Finally, the 'weekend-effect' has been identified in other hospital settings to be associated with adverse patient outcomes (22) and is not unique to psychiatric units. One common intervention used in other specialties, and readily adaptable to psychiatry, is to provide 7-day hospital services with experienced staff and access to specialised diagnostics and therapeutics (22). These findings should be used to parallel the processes used in general medical and surgical care to develop interventions reducing AEs and MEs and improve the quality of care for psychiatric patients (5, 6, 8-14).

Our study found that patients seen at hospitals with low, medium or very high patient volume (compared with high volume) and rural hospitals (compared with urban) were more likely to have AE or ME. Operating at overcapacity and with understaffing and higher patient-to-nurse ratios are factors known to be associated with an increase in patient safety event rates (23). On the other hand, smaller hospitals may be under resourced leading to an increased risk of AEs. The optimal equilibrium of staffing and resources to provide safe care may be present in high volume hospitals. Such equilibrium may be lacking in very high volume hospitals, where the most ill patients likely present for treatment. Similarly, the findings regarding rural hospitals may point to the need for improvements in the areas of staffing, staff training, and process management. Improving systems of care and structural

issues that put patients at risk of experiencing a patient safety event can be instrumental in developing interventions.

It is not surprising that organisational factors play a key role in maintaining a safe and therapeutic environment given our understanding of the nature of the hospital milieu and prior research on safety in hospital-based mental health settings (24). A potential intervention, *Safewards*, is an example of a major innovation that addresses several organisational factors in order to improve the safety of inpatients on psychiatric wards (25). *Safewards* consists of strategies that address six key domains: the staff team, the physical environment, events and relations outside the hospital grounds, the patient community, patient characteristics, and the regulatory framework (26), suggesting that certain aspects of patient safety in inpatient psychiatry can be improved by implementing systems or organisational interventions.

Limitations

As with every study, this study had limitations. First, chart review studies may not document the full nature and outcomes of care. However, existing research shows that systematic methods of detecting AEs are 10 times more effective at detecting AEs than other methods, such as voluntary reporting (27). Second, the use of administrative data to test patient and hospital predictors may be influenced by the presence of measurement error for those clinical characteristics (for example, diagnosis) that are not collected by validated instruments. Third, we did not have access to data about important covariates, such as comorbid medical issues that may complicate risk for AEs and MEs and socio-economic status. Fourth, because only one hospital included in this study was a for-profit hospital, we were unable to examine the potential role of ownership in the occurrence of AEs and MEs. Fifth, the presence and extent of patient psychological harm is difficult to ascertain in a chart review, a trauma-informed lens that considers these factors should be employed when designing future research and safety interventions in inpatient psychiatry. Sixth, this study of inpatient psychiatric hospitalisations was conducted at general acute care hospitals and might not be applicable to psychiatric hospitals or longer-term units. For example, patients admitted to general hospitals are likely to have a shorter stay compared with patients admitted to stand-alone psychiatric hospitals. Finally, these findings may not be

generalisable to other states given the role of varying state regulations (licensure, policies, insurance mandates, and so forth).

Implications

Essential to patient safety is understanding the underlying patterns of patients and provider factors that are associated with AEs and MEs. Ours is the first large scale study using an established methodology (17) to examine predictors of AEs and MEs in inpatient psychiatric units, providing new information about the patient and hospital factors associated with patient safety events in psychiatric inpatients of acute general care hospitals. Extensive inter-hospital variability exists in rates of AE and ME in medical/surgical hospitalisations (21, 27), which suggests that ‘poor’ performing hospitals could learn from ‘high’ performers by comparing hospitals systems, identifying gaps and improving care. In general medicine, research has established a framework to lower rates of preventable harm (10) in five steps: measurement, evidence-based care practices, investment in implementation sciences, local ownership and peer learning, and aligning and synergizing efforts around common goals and measures. The field of mental health care would do well to adopt a similar framework in which this and other studies measuring AEs and MEs can serve as a first step. From our findings, we can then move to the next step and develop evidence-based practices that address the specific vulnerabilities to patient safety in inpatient psychiatry, by using high-quality interventions focused on improving care paths, such as “plan-do-study-act” cycles (28). These interventions should be targeted to patient groups with the highest risk of experiencing a patient safety event. The effectiveness of improvement interventions could be evaluated by using the recently published road map from an international consensus group in the field of psychiatry (29). Future studies should continue the steps along the framework in order to develop comprehensive safety improvements for this vulnerable patient population.

Conclusions

This study examined risk factors for a broad array of safety events in inpatient psychiatric care at acute care general hospitals. The patient and hospital factors that we identified as predicting patient safety events suggest that policies and practices should be targeted at the unit and hospital level to ensure an adequate and safe level of care during all shifts and at all

hospitals regardless of location. By targeting opportunities and strategies to prevent AEs and MEs in inpatient psychiatry, the field moves one-step closer to the end goal of ensuring that psychiatric inpatients receive care in a safe environment.

Conflict of interest & funding

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Online supplement 3.1: Patient safety event definitions

Available online at the journals website

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CHAPTER 4

Association between characteristics of
nursing teams and incidence
of patients' aggressive behaviour
in acute psychiatric wards

- a two-year follow-up study

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Submitted

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DOORS**

Abstract

BACKGROUND Aggressive behaviour causes serious harm to both patients and staff members of acute psychiatric wards. Its prevention is an important ambition of mental health care globally. To develop adequate preventive strategies, we need insight in modifiable factors that influence the incidence of aggressive behaviour.

AIMS To estimate the effect of nursing team, shift and patient characteristics on aggressive behaviour of patients.

METHODS In a two-year follow-up study on an acute psychiatric admission ward, we estimated the effect of nursing staff characteristics at shift team level and patient characteristics on the incidence of aggressive patient behaviour. As part of nursing staff characteristics, we measured nurses' personality traits with the NEO-FFI-3. We analysed the data using cross-classified multilevel logistic regression analysis.

RESULTS We counted 802 incidents of aggressive behaviour (438 verbal only, 364 physical). We found that the incidence of verbal and physical aggressive behaviour was higher in teams with a majority of female nurses. Teams scoring high on extraversion experienced more verbal aggression and teams scoring high on neuroticism more physical aggression. Younger patients and/or involuntarily admitted patients were more likely to be aggressive.

CONCLUSIONS The current findings suggest that team composition may affect the likelihood of encountering patient aggression.

Introduction

Aggressive behaviour on psychiatric wards imposes a high risk of adverse outcomes for patients and staff (1-6). Aggressive behaviour varies in manifestation, ranging from verbal aggression (e.g. shouting, threatening) to physical assault (7). Nurses on closed psychiatric wards are at high risk of encountering aggressive behaviour; more than half of them are victims of assault by patients during their career (8, 9). Aggressive behaviour towards nurses on psychiatric wards causes stress, anxiety and injuries (10-14). Subsequently, aggressive behaviour is the main reason for nurses to use coercive measures (e.g. seclusion or restraint) (15-17). Coercive measures are also associated with serious adverse events (18-21). Therefore, prevention of aggressive behaviour is an important ambition of mental health care globally. If we gain more insight into the factors causing aggressive behaviour, we can use it to reduce or prevent aggressive behaviour.

Several authors have performed meta-analyses to investigate which patient characteristics influence the incidence of aggressive behaviour, such as male gender, young age and/or involuntary admission (22, 23). Although highly relevant, concentrating solely on patient characteristics to assess the risk of aggressive behaviour seems a one-sided strategy. Particular patient-staff interaction patterns and contextual factors play an important role in aggressive behaviour (24-26). To improve insight in patient-staff interaction, it seems wise to also focus on nursing staff and shift characteristics. In a systematic review, Salzmann-Erikson and Yifter (27) found that nurses who had been employed longer encountered less aggressive patient behaviour during their shift. They also reported that most aggressive incidents occurred in the evening shift and found associations between patient-staff ratio and aggressive behaviour (27). Baçoğul, Arabaci (28) found that nurses with stronger needs for positive interaction with others reported encountering more verbal aggression (28). While most authors reported results on physical violence or aggressive behaviour together, others analysed verbal and physical aggression separately and found (small) differences. Bowers, Allan (29) reported an association between presence of student nurses and verbally aggressive patient behaviour, contrary to physical aggression. Baçoğul, Arabaci (28) found that awareness of own emotions was only associated with less physical, not verbal, aggressive patient behaviour.

In summary, previous studies found several patient or nurses' characteristics being associated with aggressive behaviour of patients. To gain further insight into factors associated with aggressive behaviour in inpatients in acute mental health care, we propose to take into account nursing team, shift and patient characteristics to estimate their effect on aggressive behaviour. In the current study, we addressed the following questions:

1) Which nursing team (e.g. personality traits, gender, education), shift (e.g. patient-staff ratio) and patient characteristics (e.g. gender, diagnosis) are associated with the incidence of aggressive patient behaviour on acute psychiatric wards? 2) Do these associations differ for verbal aggression and physical aggression?

Materials and Methods

Design

We performed a two-year follow-up study on an acute psychiatric ward.

Participants & setting

We included all patients admitted to the closed acute psychiatric ward between 1 January 2013 and 31 December 2014. Earlier publication of these findings was complicated because we needed to develop a model for complex statistical analysis. The majority of admissions were involuntary and related to acute psychiatric crises leading to danger, according to the Dutch Mental Health Act. The ward had twelve patient rooms and two seclusion rooms. Frontline staff members were (student) nurses with vocational or bachelor degrees. Nurses worked in three shifts with four registered nurses on twelve patients between 7:30AM and 11:00PM (day shift and evening shift) and two nurses at night. Student nurses work on supernumerary basis.

Variables & measurements

We gathered nurses' baseline data with a case record form. Data collection on nurses consisted of gender, age, body mass index (BMI), physical stature, registration as a nurse (RN), highest education, full-time or part time employment, duration of employment, years of experience in mental health care. We defined physical stature as a nurse's subjective physical appearance, estimated on a five-point scale (very small, small, average, large and

very large). Three assessors independently rated stature; the observer agreement was moderate, Fleiss $\kappa = .43$ (30).

Psychological measurements consisted of the Big Five personality traits (neuroticism, extraversion, openness, agreeableness and conscientiousness) and general feeling of safety during their work. We assessed personality traits using an online self-report sixty-item Neuroticism Extraversion Openness Five-Factor Inventory 3 (NEO-FFI-3) (31). This instrument has adequate to good psychometric properties in patient groups and in the general population (31). Despite an extensive literature search, we were unable to obtain a validated questionnaire to measure nurses' feelings of safety on psychiatric wards. Therefore, we measured a proxy of safety using four questions with a five-point Likert scale about whether nurses generally felt safe in their organisation, on their ward, with their colleagues and with their manager.

We gathered baseline data on patients within a week after the start of their first admission to the ward during the study period, using the electronic health records. Patients' baseline data consisted of gender, age, length of admission, involuntariness of admission, primary and secondary diagnosis, whether the admission occurred after an aggressive incident and current psychiatric status (based on the Health of Nation Outcome Scale (32) and Global Assessment of Functioning (33)).

We collected shift data in all shifts during the data collection period, i.e. three times a day (day afternoon and night shift). We gathered data on the number of patients present, registered nurses and student nurses present in each shift. In addition, to prevent bias due to underreporting of aggressive events, we used the daily nursing reports. We performed outcome measurements for every patient using the Staff Observation Aggression Scale – Revised (SOAS-R), a validated instrument for monitoring the nature (verbal and/or physical) and severity of aggressive behaviour (34). Variables and measurements are described in detail in **Online supplement 4.1**.

Ethical considerations

Patients on acute psychiatric wards are a vulnerable population and researchers should be meticulous in protecting their rights (35, 36). We requested the Medical Ethics Review

Committee of our institution for approval according to the Dutch Medical Research Involving Human Subject Act (WMO). The WMO is the implementation act of international quality standards for medical research, the Declaration of Helsinki and Good Clinical Practice in particular. It considers formal approval by a medical ethics review committee mandatory if it concerns scientific medical research *and* subjects participants to procedures or requires them to follow rules of behaviour. The committee concluded that formal approval of current study was not obligatory, as our study observed routine patient care and did not subject patients to additional procedures, behavioural rules or diagnostic testing. Research on aggressive behaviour is important for improving quality and safety of mental health care. Because of the absence of impact on patients and importance of our study aims, we were allowed not to seek active consent to re-use patients' data for this study, according to the exception grounds of article 24 of the Dutch GDPR Implementation Act (37). To protect patients' privacy, only members of clinical staff performed data collection from the electronic health record. The current study used anonymised data in the analyses. Patients had the right to object to the re-use of their treatment data for scientific research and the pertinent procedure was explained on our institution's website. None of the patients objected to use of anonymised treatment data.

Staff members were asked to participate on a voluntary basis and gave permission to the use of their data in the analysis. Staff members were free to refuse participation and researchers did not communicate the (non)participation of a staff member to other staff members or management. Researchers had no hierarchical relationship with the staff members.

Statistical analysis

In this study, the 98 different nurses, over the 2 years of follow-up, formed 1299 different team compositions during 2190 shifts (3 shifts during 730 days). Most patients encountered many teams and many different nurses during their admission(s). Statistical literature refers to this non-hierarchical structure as cross-classified data (38). Cross-classification signifies that our data do not have a simple hierarchical structure in which shift teams have fixed compositions of nurses and each patient receives care from a single nurse during the entire admission. Statistically, the variances in cross-classified data are not identical to strictly hierarchical data, the data is nested in two different clustered on the same level.

Table 4.1: Baseline characteristics of nurses (n = 98)

Characteristic		Missing data, n
Male	38 (38.8)	0
Age (years), mean (SD)	36.3 (13.5)	6
BMI, mean (SD)	23.4 (3.0)	7
Stature		19
Very small	2 (2.5)	
Small	14 (17.7)	
Average	44 (55.7)	
Large	18 (22.8)	
Very large	1 (1.3)	
Registered nurse	76 (77.6)	0
Bachelor of nursing	52 (54.7)	3
Years of employment, median (IQR)	2.0 (0-5.3)	3
Years of experience in psychiatry, median (IQR)	4.0 (0-17)	4
Employment		0
Permanent staff	26 (26.6)	
Student nurses	17 (17.3)	
Temporary staff (e.g. agency staff)	55 (56.1)	
Full time staff	59 (60.2)	0

SD = Standard deviation; BMI = Body Mass Index; IQR = Interquartile range. All numbers are n (%) unless indicated otherwise

We analysed our data by constructing a cross-classified multilevel logistic regression model with occurrences of aggressive behaviour as the dependent variable and nursing team, shift and patient characteristics as independent variables. Team variables consisted of the mean score of the nurses present in a particular team, such as gender (two males and two females would yield 0.5), education and personality traits. To improve the stability of the model, we categorised numerical variables using four categories for demographic variables and three categories (cut-offs the 17th and 83rd centile values) for psychological categories, using the lowest category as the reference category. In STATA SE, version 15, we ran the `runmlwin` command to use MLwiN, version 3.02 (39). We obtained the starting values for the Markov

Chain Monte Carlo analyses using penalized quasi-likelihood estimates (PQL2). The burn-in value was 2000 and the number of chains run was 20,000. We report odds ratios and their corresponding 95% credible intervals (95% CrI). We retained variables if their p-value was smaller than .20. We describe the STATA-code in **Online supplement 4.2**.

Results

Participants

For a summary of baseline characteristics of the nursing staff, we would like to refer to **Table 4.1**. In total, 98 nurses worked at least one shift during the study period. The majority were females ($n = 60$) and mean age was 36 years (range 18 – 61). The ward had many temporary staff ($n = 55$) and (supernumerary) student nurses ($n = 17$), but they worked fewer shifts than the permanent nursing staff members did. Incomplete case record forms ($n = 7$) were the main cause of missing data.

Table 4.2: Psychological traits of nursing staff ($n = 62$)

	Sample, mean (SD)	Cronbach's α	Reference group, mean (SD)
NEO-FFI-3			
Neuroticism	29.5 (6.1)	.782	34.0 (7.5)
Extraversion	43.3 (6.1)	.812	39.3 (5.8)
Openness	42.5 (5.2)	.688	38.9 (5.7)
Agreeableness	45.2 (4.6)	.617	41.1 (5.6)
Conscientiousness	44.7 (5.3)	.765	43.4 (5.7)
General feeling of safety	15.4 (2.4)	.899	

NEO-FFI-3 = Neuroticism Extraversion Openness Five Factor Inventory 3d version; SD = Standard deviation

Reference group based on a representative sample ($n = 1715$) from the Dutch population (41).

Table 4.2 contains the psychological trait scores of the nurses. Internal consistency was acceptable for neuroticism, extraversion, conscientiousness, and the general feeling of safety and low for openness and agreeableness. This is in line with findings in several samples in the Dutch population (40). The average team scores of the nurses are higher on extraversion and openness and lower on neuroticism, compared to reference categories in

the general Dutch population (40). Thirty-six nurses did not respond to (n = 32) or refused participation (n = 4) on the researchers' request to fill out the psychological questionnaire. Most non-responders were temporary staff members (n = 33).

Table 4.3 contains a summary of patients' baseline characteristics. There were 224 patients, of whom 57 had multiple admissions. The majority of patients were males (n = 133; 59%) and their mean age at first admission was 39 years (range 18 – 80). The majority of the patients (n = 151; 67%) were admitted involuntarily under the Dutch Mental Health Act (BOPZ). Almost half of the patients (n = 108; 48%) showed aggressive behaviour on the ward at least once.

Outcomes

Table 4.4 contains the observations of aggressive behaviour. We documented 802 aggressive incidents during the data collection period. We divided aggressive incidents into verbal (i.e. "verbal aggression" and "physically threatening" in the SOAS-R) and physical aggression (i.e. "physical violence towards goods", physical violence towards nursing staff" and "physical violence towards fellow patients" in the SOAS-R). We documented 438 incidents of verbal aggression only and 364 incidents of physical aggression.

Main results

In multilevel modelling, we observed high collinearity between nurses' experience in mental health care and nurses' age. We dropped age from the final analysis since we deemed experience a more important concept than age for our purpose. To reduce the complexity of the model, we dropped the following nursing team and shift characteristics from the final model due to their limited influence on the final model (since their odds ratios had p-values $\geq .20$): BMI, work experience, full-time or part time employment, years of employment in the current hospital, patient-staff ratio. Similarly, we dropped the following patient-related characteristics: seclusion in patient's history, Dutch citizenship, current admission after aggressive behaviour, first admission in mental health care, admission during weekends. We present the results of the final regression model in **Table 4.5**.

Table 4.3: Baseline characteristics of patients at first admission (n = 224)

Characteristic	Aggression group (n = 108)	Non-aggression group (n = 116)	Group difference (p-value)
Male, n (%)	67 (62.0)	66 (56.9)	.496 ^a
Age (years), mean (SD)	37.0 (13.7)	40.6 (13.2)	.050 ^b
Length of admission (days), median (IQR)	21 (0-42)	7 (5-21)	<.001 ^c
Involuntary admission, n (%)	85 (78.7)	65 (56.0)	<.001 ^a
Primary diagnosis, n (%)			.003 ^d
Psychotic disorder	81 (75.0)	70 (60.3)	
Bipolar disorder	16 (14.8)	13 (11.2)	
Other disorder	11 (10.2)	33 (28.5)	
Secondary diagnosis, n (%)			
Substance abuse	53 (49.1)	39 (33.6)	.021 ^a
Personality disorder	10 (9.3)	15 (12.9)	.405 ^a
Intellectual impairment	8 (7.4)	7 (6.0)	.791 ^a
Admission after aggressive behaviour, n (%)	41 (40.0)	29 (25.0)	.044 ^a
First admission in mental health care, n (%)	27 (25.0)	36 (31.0)	.373 ^a

^a Fisher's Exact test, two-sided; ^b Student's t-test, independent samples; ^c Mann-Whitney U test, independent samples; ^d Chi square test, two-sided (df = 2); SD = Standard deviation; IQR = Interquartile range

Table 4.4: Characteristics of aggressive behaviour, measured by SOAS-R

Provocation	N (%)	Means used by the patient	N (%)	Target of aggression	N (%)
No understandable provocation	227 (28.3)	Verbal aggression	438 (54.6)	Nothing/nobody	111 (13.8)
Provoked by other patient(s)	65 (8.1)	Ordinary objects (e.g. furniture)	126 (15.7)	Object(s)	113 (14.1)
Help with ADL	53 (6.6)	Parts of body (e.g. punching)	221 (27.6)	Other patient(s)	76 (9.5)
Patient being denied something	299 (37.3)	Dangerous objects (e.g. knife)	17 (2.1)	Patient self	14(1.7)
Administration of medication	78 (9.7)			Staff member(s)	462 (57.6)
Other provocation	80 (10)			Other person(s)	26 (3.2)

Table 4.4 Continued

Consequences for victim(s)	N (%)	Measures to stop aggression	N (%)
None	148 (18.5)	None	53 (6.6)
Damaged objects	31 (3.9)	Talk to patient	353 (44.0)
Persons, felt threatened	569 (70.9)	Calmly brought away	24 (3.0)
Persons, pain	41 (5.1)	Enteral medication	69 (8.6)
Persons, injuries	13 (1.6)	Parenteral medication	25 (3.1)
		Physical restraint	8 (1.0)
		Mechanical restraint/seclusion	179 (22.3)
		Other	91 (11.3)

Nursing team & shift variables

We found that during shifts with teams composed of >75% males there were fewer aggression incidents than in shifts with teams composed of females only, OR .56 (95% CrI .34–.82). Higher team scores on personality trait extraversion were associated with more aggressive behaviour, OR 1.67 (95% CrI 1.21–2.27). Higher team scores on neuroticism showed a non-significant trend towards more aggressive behaviour, OR 1.23 (95% CrI .90–1.53). We observed less aggressive behaviour in the night shift compared to the day shift.

Patient variables

Patient characteristics showed relatively strong associations with aggressive behaviour. Younger patients or those with involuntary admissions were more likely to exhibit aggressive behaviour. The same held for those with bipolar disorder, comorbid personality disorder and comorbid intellectual impairment. Comorbid substance abuse was associated with a lower probability of showing aggressive behaviour.

Verbal & physical aggression

Distinguishing between the two kinds of aggressive behaviour, verbal and physical, broadly showed the same picture, with a few notable exceptions, namely the associations with extraversion, neuroticism and general feelings of safety. The association between high team scores on extraversion and more aggressive behaviour was primarily due to verbal aggression, OR 2.47 (95% CrI 1.56–3.58). The association between higher team scores on neuroticism and more aggressive behaviour showed an opposite trend, the association was somewhat stronger for physical aggression, OR 1.40 (95% CrI 1.00–1.90). High team score on feelings of safety of nurses was associated, although not statistically significant at the .05 level, with more verbal aggression, OR 1.46 (95% CrI .98–2.08). Considering patient characteristics, diagnosis and comorbidity showed several differences between verbal and physical aggression. Diagnoses other than psychotic disorder were associated with less verbal aggression and more physical aggression. Comorbid personality disorder was associated with more physical aggression, but not with verbal aggression. The association between comorbid intellectual impairment and verbal aggression was statistically significant, but not for physical aggression.

Table 4.5: Results of the final analysis

		Aggressive behaviour (n = 802)		Verbal aggression (n = 438)		Physical aggression (n = 364)	
		OR (95% CrI)	P	OR (95% CrI)	P	OR (95% CrI)	P
Nursing team characteristics							
Gender			<0.001				
Only female nurses	reference			reference		reference	0.006
Mixed team, majority females (>50%)	.701 (.582 - .849)	0.002		.670 (.508 - .869)	0.004	.754 (.557 - .981)	0.040
Mixed team, majority males (50 - 75%)	.710 (.563 - .884)	0.004		.735 (.542 - .974)	0.036	.699 (.513 - .950)	0.028
Mostly male nurses (>75%)	.555 (.342 - .821)			.628 (.331 - 1.082)	0.088	.523 (.254 - .906)	0.030
Stature (quartiles)		0.887			0.966		0.869
1	reference			reference		reference	
2	.817 (.628 - 1.036)	0.100		.727 (.497 - 1.030)	0.066	.960 (.658 - 1.349)	0.744
3	1.101 (.869 - 1.364)	0.442		1.191 (.875 - 1.578)	0.260	1.013 (.735 - 1.382)	0.976
4	1.088 (.834 - 1.369)	0.522		1.174 (.842 - 1.597)	0.370	1.007 (.675 - 1.446)	0.946
Team with only registered nurses	.990 (.814 - 1.177)	0.904		1.176 (.899 - 1.508)	0.246	.809 (.591 - 1.074)	0.130
Nursing team psychological characteristics							
Neuroticism [†]		.075			0.432		0.110
1	reference			reference		reference	
2	1.233 (.989 - 1.529)	.060		1.124 (.850 - 1.482)	0.440	1.396 (1.004 - 1.900)	0.046
3	1.238 (.929 - 1.160)	.144		1.175 (.780 - 1.696)	0.480	1.307 (.824 - 1.938)	0.278

Table 4.5 Continued

Extraversion [†]		0.015	0.001	0.661
1	reference		reference	
2	1.136 (.903 - 1.405)	0.304	1.467 (1.034 - 2.028)	.890 (.644 - 1.206)
3	1.666 (1.210 - 2.270)	<0.001	2.470 (1.564 - 3.582)	1.000 (.627 - 1.498)
Openness [†]		0.535	0.526	0.810
1	reference		reference	
2	1.147 (.911 - 1.568)	0.276	1.272 (.918 - 1.736)	1.028 (.739 - 1.423)
3	1.035 (.766 - 1.372)	0.854	1.015 (.672 - 1.461)	1.086 (.703 - 1.579)
Conscientiousness [†]		0.145	0.130	0.368
1	reference		reference	
2	1.249 (0.974 - 1.568)	0.082	1.409 (.997 - 1.943)	1.159 (.820 - 1.571)
3	1.184 (.874 - 1.580)	0.272	1.271 (.838 - 1.873)	1.226 (.797 - 1.782)
Agreeableness [†]		0.776	0.731	0.773
1	reference		reference	
2	1.005 (.822 - 1.234)	0.974	1.077 (.810 - 1.387)	.931 (.687 - 1.239)
3	.947 (.713 - 1.236)	0.644	.863 (.574 - 1.246)	1.016 (.660 - 1.484)
General feeling of safety [†]		0.226	0.099	0.790
1	reference		reference	
2	1.101 (.877 - 1.365)	0.416	1.206 (.849 - 1.642)	.981 (.725 - 1.331)
3	1.216 (.925 - 1.552)	0.162	1.462 (.975 - 2.079)	.969 (.640 - 1.398)

Table 4.5 Continued

Shift characteristics	reference		reference		reference	
Day shift						
Evening shift	.916 (.766 - 1.104)	0.306	.903 (.718 - 1.134)	0.340	.951 (.727 - 1.215)	0.640
Night shift	.290 (.216 - .381)	<0.001	.221 (.142 - .318)	<0.001	.423 (.285 - .607)	<0.001
Patient characteristics						
Male	1.161 (.979 - 1.358)	0.084	1.225 (.972 - 1.521)	0.088	1.053 (.842 - 1.299)	0.686
Age [†]	.893 (.866 - .920)	<0.001	.902 (.866 - .938)	<0.001	.884 (.847 - .923)	<0.001
Primary diagnosis						
Psychotic disorder	reference		reference		Reference	
Bipolar disorder	1.666 (1.370 - 1.974)	<0.001	1.655 (1.287 - 2.096)	<0.001	1.636 (.237 - 2.105)	<0.001
Other diagnosis	1.008 (.740 - .1341)	0.984	.413 (.211 - .698)	0.004	1.712 (1.134 - 2.351)	0.010
Comorbidity						
Substance abuse	.694 (.591 - .798)	<0.001	.715 (.570 - .881)	<0.001	.686 (.538 - .850)	<0.001
Personality disorder	1.499 (1.160 - 1.891)	<0.001	1.096 (.739 - 1.529)	0.652	1.899 (1.365 - 2.517)	<0.001
Intellectual impairment	2.204 (1.792 - 2.670)	<0.001	2.911 (2.232 - 3.668)	<0.001	1.248 (.847 - 1.734)	0.274
Involuntary admission	4.838 (3.313 - 7.114)	<0.001	4.210 (2.257 - 7.469)	<0.001	5.519 (3.281 - 9.355)	<0.001

CrI = Credible interval; † Cut-offs at centile 17 and 83; ‡ Effect size of patient's age is reported in age differences (steps) of 5 years.

Discussion

We investigated the influence of nursing team, shift and patient characteristics on the incidence of patients' aggressive behaviour on an acute psychiatric ward. More female nurses in teams were associated with more aggressive behaviour. Furthermore, higher team scores on extraversion was associated with more aggressive behaviour. Aggressive behaviour was least likely during the night shift. High team score on extraversion was strongly associated with verbal aggression, but not with physical aggression. In contrast, high team score on neuroticism was associated with physical aggression, but not with verbal aggression. Furthermore, high team score on feelings of safety tended to be associated with verbal aggression. We found several patient characteristics (young age, diagnoses other than psychotic disorder, psychiatric comorbidity and involuntary admission) to be associated with aggressive behaviour. We observed differences in patients' gender, diagnosis and psychiatric comorbidity between the models of verbal and physical aggression.

Our finding that aggressive behaviour occurs least during night shifts is supported by previous findings (27). This seems obvious, because patients tend to sleep at night and (potentially provoking) events, such as medication administration, concentrate during daytime. We found that young patients most prone to show aggressive behaviour. Furthermore, involuntary admitted patients have higher odds to show aggressive behaviour. This is in line with the findings of several systematic reviews (22, 23, 27). Salzmann-Erikson and Yifter (27) found evidence in their review for an association of several diagnostic categories with aggressive behaviour, such as psychotic disorders, bipolar disorder and personality disorders. Equivocalness in the findings of diagnostic categories suggest that these findings are highly sample-dependent and generalisability is limited. Previous studies found that the associations between various patient characteristics and aggressive behaviour were not influenced by the type of aggression (27).

We found associations between higher nursing teams' mean of the personality trait extraversion and more verbal aggression and higher nursing team's mean of the personality trait neuroticism and more physical aggression. Extravert individuals are characterised by enthusiasm, are full of energy, and they can be perceived as dominant in groups of people (31). This finding may indicate that extravert staff members' more dominant behaviour can

serve as a trigger for patients' aggression. However, another possible explanation is that teams with high levels of extraversion more actively seek interaction with patients and therefore encounter more verbal aggression. Neurotic persons are characterised by emotional instability and are relatively sensitive to stress and anxiety (31). A possible explanation for the association between neuroticism and physical aggression could be a tendency of teams with high levels of neuroticism to be anxious to intervene early in the development of aggressive behaviour and therefore may encounter more physical aggression. There is little evidence on the association between staff personality trait and patients' aggressive behaviour. Bilgin (41) measured nurses' interpersonal styles with the Interpersonal Style Inventory (42) and reported associations between nurses with a less sociable and less tolerant interpersonal style and physical assault by patients and relatives. Sociable individuals prefer working together and they interact with others, and tolerant individuals are generally able to handle stress and provocation more calmly (41). This seems in line with our finding that high team levels of neuroticism are associated with more physical aggression. Başoğlu, Arabacı (28) used the sociotropy-autonomy scale to measure personality traits of nurses. They found an association between sociotropic personality characteristics and verbal aggression. Sociotropic individuals have good empathy skills and interest in helping others during interpersonal interaction and may be comparable to the agreeableness personality trait, which we found to be not associated with aggressive behaviour. However, extrapolation of the personality traits we measured to other models of psychological characteristics is highly speculative. Therefore, we are cautious when interpreting these comparisons.

Lastly, we found a non-significant trend towards higher team score of feelings of safety and more verbal aggressive behaviour. A possible explanation for this finding, apart from chance, is that teams that generally feel safer tend to seek more interaction with patients and therefore encounter more verbal aggressive behaviour. Current and former findings could generate hypotheses for future research on the effects of feelings of safety of staff members on acute psychiatric wards.

Strengths and limitations

Our study addressed the association between nursing personality traits based on the Five Factor model and the incidence of aggressive patient behaviour. To the best of our knowledge, earlier studies did not investigate this topic with a reliable and validated personality questionnaire. Furthermore, we analysed the data with cross-classified multilevel models, which decreases the chance of overestimation of the precision of our findings. We acknowledge several limitations. We gathered data on patients' current clinical state using the (GAF and HoNOS) which we, unfortunately, had to exclude from the final analysis because of poor quality. Therefore, we were unable to account for the influence of severity of the disorder on the risk to show aggressive behaviour. Our finding that aggressive patients have significantly longer admissions supports this assumption, as poor clinical state also increases the duration of admission. We collected data about patients on the first day of their first admission and about nurses at their first shift in the data collection period. Subsequently, variables such as age and work experience were not fully accurate across the 2-year period, which could be a (weak) source of bias. Furthermore, nurses were aware of the fact that we performed a study about aggressive behaviour. We cannot rule out that this influenced their behaviour or their reporting of aggressive behaviour, although we used the daily nursing reports as primary data source. We analysed nursing characteristics at the team level. The cross-classified data structure limited the possibility to analyse the effect at the level of individual nurses, due to non-convergence of the statistical model when adding another level. This prevented us from analysing the influence of individual characteristics of nurses. Due to the complexity of the statistical model, we were not able to analyse interaction variables between patient and team characteristics. This simplifies the far more complex situation on psychiatric wards and limits generalisability of our findings. Lastly, this was a monocentre study, which could also limit the generalisability of our findings.

Implications for clinical practice

The reported associations between nurses' gender, or personality traits extraversion and neuroticism with verbal or physical aggression may raise nurses' awareness about factors that can negatively influence their interactions with patients. These findings may help in development of interventions to prevent aggressive behaviour. Our findings suggest that

nursing teams with extrovert personalities are more at risk to encounter patient aggression than teams with more introvert nurses are. This might imply that patients benefit from an interaction strategy with low expressed emotions. The association between a neurotic personality structure and physical aggression is a new finding and requires replication. Anxious or controlling behaviour of nurses might not protect against aggressive behaviour, perhaps because nurses who feel safe reach out to patients earlier in the development of aggressive behaviour to de-escalate the situation. These suggestions could serve as a starting point for further qualitative (e.g. phenomenological analysis or participative observation of patient-staff interaction) and quantitative research on nurses' personality traits in relation to the patient outcomes. This knowledge might be able to guide clinicians, educators and policy makers to personalise the training and professional guidance of staff members on psychiatric wards in order to prevent or de-escalate aggressive behaviour.

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Conflict of interest & funding

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Online supplement 4.1: List of variables

Available upon request.

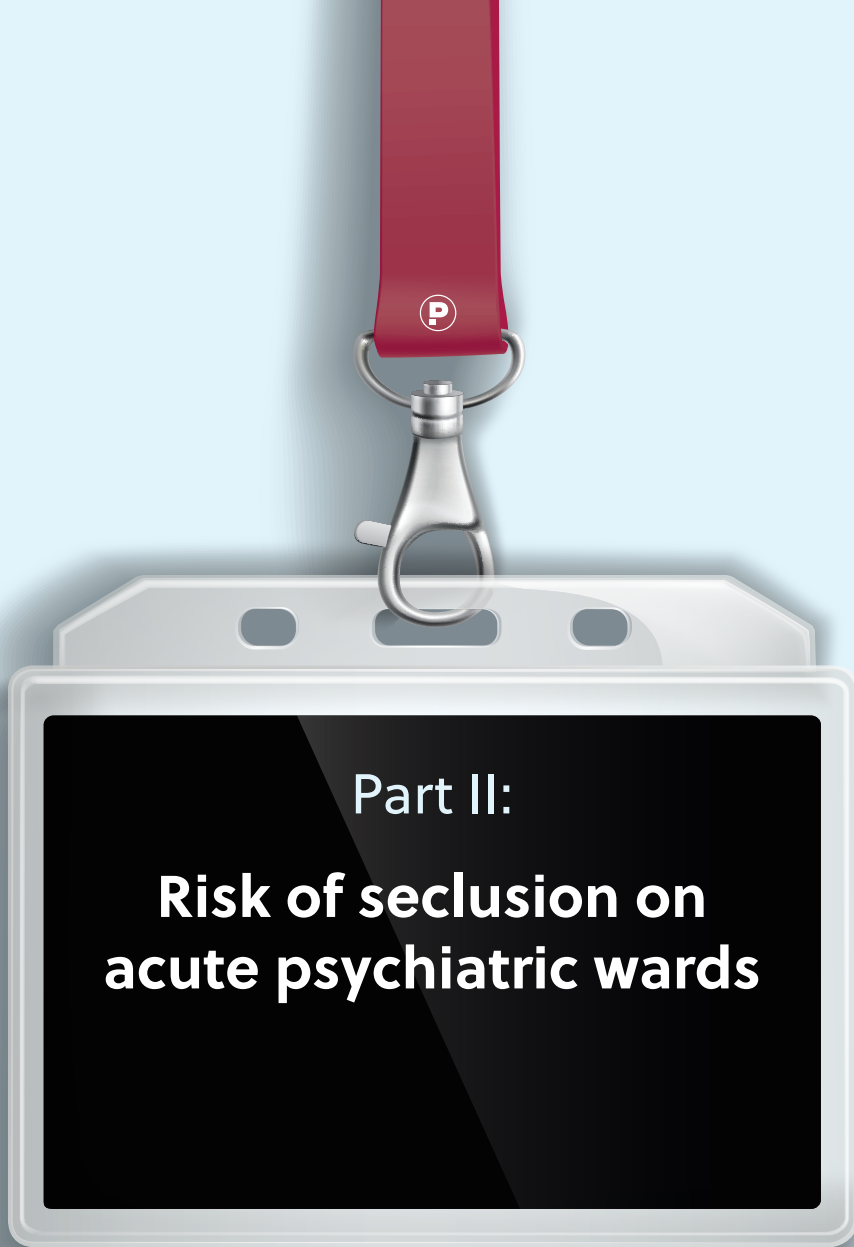
Online supplement 4.2: Stata code for cross-classified multilevel regression analysis

Available upon request.

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Part II:

**Risk of seclusion on
acute psychiatric wards**

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CHAPTER 5

Influence of nursing staff attitudes and characteristics on the use of coercive measures in acute mental health services – a systematic review

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Abstract

INTRODUCTION The use of coercive measures generally has negative effects on patients. To help prevent its use, professionals need insight in what nurses believe about coercion, and which staff determinants may influence its application. There is need for an integrated review on both attitude and influence of nurses on the use of coercion.

AIM To summarise literature concerning attitude of nurses towards coercive measures and the influence of staff characteristics on the use of coercive measures.

METHOD Systematic review

RESULTS The attitude of nurses changed during the last two decades from a therapeutic to a safety paradigm. Nurses currently view coercive measures as undesirable, but necessary to deal with aggression. Nurses express the need for less intrusive interventions, although familiarity probably influence its perceived intrusiveness. Literature on the relation between staff characteristics and coercive measures is inconclusive.

DISCUSSION Nurses perceive coercive measures as unwanted but still necessary to maintain safety on psychiatric wards. Focussing on the determinants of perception of safety might be a promising direction for future research.

IMPLICATIONS FOR PRACTICE Mental health care could improve the focus on the constructs of perceived safety and familiarity with alternative interventions to protect patients from unnecessary use of coercive interventions.

Introduction

Aggressive behaviour is a broad behavioural construct that includes the concept of violence and causes safety issues in mental health care (1, 2). The definition of violence is an act including physical force such as slapping, punching, kicking and biting; use of an object as a weapon; aggressive behaviour such as spitting, scratching and pinching; or a verbal threat involving no physical contact (3). The prevalence of physical violence of patients during psychiatric admission differs in Western countries between 7.5% and 15% (4). To protect patients and staff on psychiatric wards from harm caused by violence, professionals use coercive measures, such as seclusion, restraint and compulsory medication (5). In Europe, some countries use seclusion as a “preferred” intervention of last resort in case of dangerous situations, while others resort to physical or mechanical restraint (6). Coercive measures have no therapeutic value and can result in posttraumatic stress and severe physical injuries for patients (7-11). Consequently, prevention of coercive measures has become a priority of care professionals, researchers and policy makers in mental health services. The international mental health community developed several quality improvement projects in the last few years to diminish its use (12-15).

To help prevent the use of coercive measures, it is important to know about variables that are predictive for its use. In their systematic review on patient and staff characteristics associated with higher use of restraint, Beghi, Peroni (16) reported that male gender, young age, foreign ethnicity, involuntary admission, diagnosis of schizophrenia and presence of male staff were variables associated with more use of restraint. Laiho, Kattainen (17) described the influence of previous experience of nurses with coercion on the decision to use coercive measures. The attitude of nurses towards coercive measures is also important. In their systematic review on nurses’ attitudes towards coercion, Happell and Harrow (18) found a contradiction between practice of seclusion and attitudes and beliefs of nurses about its efficacy and appropriateness. Nurses acknowledged that seclusion had a negative impact on service users, but inpatient violence justified its use (18). This is in line with other review studies, such as Riahi, Thomson (19) and Laukkanen, Vehvilainen-Julkunen (20) who concluded that coercive measures are still seen as necessary measure of “last resort”, although the attitude of nurses is turning increasingly negative. Furthermore, Riahi, Thomson (19) suggest that staff composition and nurses’ perception are important themes

in the decision making process towards the use of coercive measures. Happell and Harrow (18) suggest that future research needs to consider staff characteristics together with attitude towards seclusion. Currently, a systematic review that evaluates both the attitude of nurses and the influence of nursing staff characteristics related to coercive measures is lacking.

Aims

The aim of this paper is to summarise scientific literature concerning the attitude of nurses towards coercive measures and the influence of nursing staff characteristics on both the use of and the attitude towards coercive measures in acute mental health services. Our research questions are: 1) What are the attitudes of psychiatric nurses towards use of coercive measures? 2) Which individual or team nursing staff characteristics are associated with the use of coercive measures and with the attitude of nurses towards coercive measures in acute mental health services?

Methods

Design

We performed a systematic review and used the PRISMA-statement to guide our reporting (21). We defined attitude towards coercive measures according to Bowers, Van der Werf (22) p.358 as “the pattern of beliefs, judgements and feelings about coercive measures”. We divided nursing staff characteristics into individual characteristics (e.g. gender, age, personality traits), professional characteristics (e.g. education, work experience) and organisational characteristics (e.g. staff-patient ratio).

Search

We performed electronic searches in Medline (via OvidSP, 1946 – March 14th 2019), Embase (via OvidSP, 1947 – March 14th 2019), PsycINFO (via OvidSP 1880 – March 14th 2019) and CINAHL Plus (1937 – March 14th 2019). We describe the full search strategy in **Online supplement 5.1**. A clinical librarian assisted with our search. We used no restrictions on language or publication date. We searched reference lists of previous reviews and included

studies to find additional publications. We also searched trial registers for registered cohort studies.

Study selection

We performed the first selection based on title and abstract. We subsequently retrieved the full text of the included studies for the final assessment of eligibility. Two reviewers (PD and JV) performed the selection independently and settled disagreements through discussion. In case of disagreement, the reviewers consulted a third reviewer (CL).

We selected studies based on inclusion and exclusion criteria. Inclusion criteria concerning study design were cohort studies, case control studies, case series, cross-sectional studies, surveys and qualitative studies on the attitude of nursing staff towards coercive measures and/or the influence of nursing staff characteristics on the use of one or more coercive measures (seclusion, mechanical restraint, physical restraint and compulsory medication). We included studies performed in acute mental health inpatient services or psychiatric facilities in general or academic hospitals that cared for psychiatric patients with primary diagnosis of axis I or II of the DSM-IV-TR (23), except addiction disorders and learning disabilities or their equivalent in the DSM-5 (24). Studies that included also other professionals (such as physicians) and other settings (such as forensic wards) were included if the majority (>50%) of the staff members or settings met our inclusion criteria. We excluded studies performed solely in forensic, child, adolescent and geriatric psychiatry, in general hospital wards, emergency departments, nursing homes or with an outpatient patient population. We excluded studies that addressed aggressive behaviour as outcome measure. We also excluded reviews, case reports, theses, conference abstracts and non-empirical publications, such as editorials.

Assessment of the risk of bias

We used the Quality in Prognostic Studies (QUIPS) tool (25) for cohort studies, the Newcastle-Ottawa Scale (NOS) (26) for case control studies and the Consolidated criteria for reporting qualitative research (COREQ) (27) for qualitative research.

Data extraction and analysis

Two independent reviewers (PD & JV) performed the data extraction with a standardized form. Studies that described the attitude of nurses were mostly qualitative or survey studies and the results were not suitable for statistical pooling. We carefully read the studies and extracted important themes from these studies independently. Thereafter, we discussed the interpretation of the qualitative findings. Subsequently, we extracted descriptive themes from the analysis of the qualitative studies based on consensus between the reviewers and combined these with the results from the surveys. We observed that literature on nursing staff characteristics had high levels of heterogeneity, which made it unlikely that performing a meta-analysis would be appropriate. We summarised the most important results of the included studies. We extracted data on the research question, design, sample size, population, setting and outcome measures from the included studies.

Results

Search results and quality assessment

The initial search resulted in 7517 references. After the selection process, we included 84 publications (**Figure 5.1**). Amongst these were papers written in English [78], Dutch [2], German [2] and French [2]. Sixty of these papers reported on the attitudes of nurses and 31 papers reported on the influence of nursing staff characteristics. The data of a large cross-sectional study from the United Kingdom, named City-128, accounted for seven publications (28-34). A cross-sectional study from Norway accounted for two publications (35, 36) and a survey from Australia accounted for two publications (37, 38). These papers were not duplicates, but described different analyses based on a single, large dataset. Therefore, we included 76 unique studies in our review, of which four were prospective cohort studies, five were retrospective cohort studies, four were case-control studies, one was a mixed-method study, nine were cross-sectional studies, 31 were surveys and 22 were qualitative studies. These studies originated from 25 different countries. We provide an overview of the included studies in **Online supplement 5.2**.

The quantitative studies showed large clinical and methodological heterogeneity. Most of the studies were cross-sectional studies or surveys based on questionnaires. Several of these

studies used self-developed questionnaires of which the psychometric properties were unknown. Others used validated questionnaires, mostly the Attitudes Toward Seclusion Survey (39) and the Attitudes to Containment Measures Questionnaire (40). Sample size varied from very small (e.g. questionnaire administered with n = 13 nurses (41)) to very large (e.g. cross-sectional study with n = 11128 admissions over 136 psychiatric wards (28)). The available cohort studies and case-control studies often had methodological limitations, such as small sample sizes, retrospective design, limited information on the sampling procedure and data collection on a single ward or hospital. Most of the studies from the eighties and early nineties presented no comprehensive description of the method, statistics and results. The majority of the qualitative studies were of moderate quality. The comprehensiveness of reporting of qualitative studies showed substantial improvement in the last decades, especially in methodological rigour.

Attitudes towards coercive measures

In our study of the included literature on the attitudes of nurses towards coercive measures, we observed two major themes: 1) the discrepancy between treatment paradigm and safety paradigm; and 2) the need for less intrusive alternative interventions.

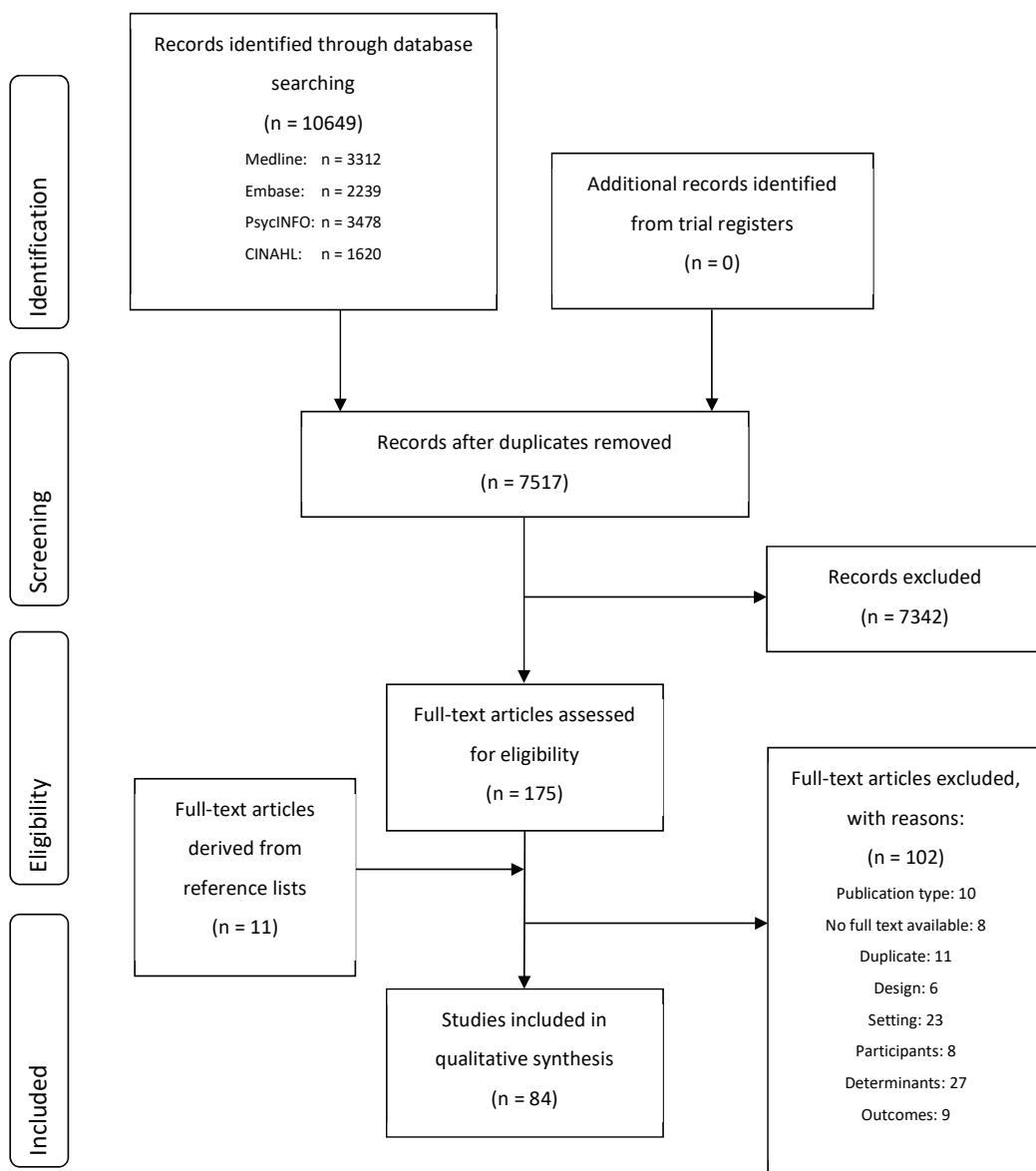
Treatment paradigm versus safety paradigm

We observed a paradigm shift in the attitude towards coercive measures from a treatment paradigm to a safety paradigm. The belief that patients experience therapeutic benefits from the use of coercive measures characterizes the treatment paradigm. Distinctive for the safety paradigm is the belief that the patient undergoing coercive measures experience negative consequences, but coercive measures are necessary to maintain safety for patients and staff members.

Tooke and Brown (41) were the first to report attitudes of nurses from the therapeutic paradigm and found that nurses believed seclusion was a calming, therapeutic experience. Coercive measures were seen as effective interventions to protect patients' dignity (42). Nurses considered seclusion of violent patients potentially beneficial for other patients and believed seclusion had a calming effect on the secluded patients (43-45).

After 2010, reports that supported the therapeutic paradigm became scarce, although it seems clear that a minority of nurses still view coercive measures as calming for specific types of patients (46-48). Differences of opinion and moral dilemmas among nurses were reported (47-49).

Figure 5.1: Prisma flow diagram



An early example of the safety paradigm was DiFabio (50), who reported that although nurses had numerous emotional and negative experiences with restraint, its use was necessary to control patients' behaviour in case of dangerous situations. Lendemeijer (51) stated that the safety of psychiatric wards prevailed over the individual patient's interest and therefore seclusion was required.

The necessity of using seclusion and other coercive measures in case of aggressive behaviour, despite doubts on the therapeutic effect, was also reported by several other authors during the nineties (52-55). In the following decade, nurses reported feelings such as disapproval, failure, guilt and regret after using coercive measures (44, 45, 56-60). Bigwood and Crowe (61) stated that physical restraint was undesirable but unavoidable: "it's part of the job, but spoils the job". Lemonidou, Priami (62) found that nurses had "positive" attitudes towards seclusion, but mainly because they viewed seclusion as necessary, not desirable. Nurses viewed seclusion as effective for controlling "difficult situations", but also expressed their concerns about negative consequences for patients (63). From 2010, the paradigm shifted more and more towards coercive measures being a "necessary evil", rather than a therapeutic tool (64). Numerous studies reported that nurses considered coercive measures unwanted and harmful, but necessary to regain safety in the case of aggressive behaviour (37, 38, 46, 48, 64-76).

In sum, the necessity of coercive measures for dealing with danger due to aggressive behaviour of patients seems a key element of the current attitude of nurses.

Need for less intrusive alternative interventions

Our second theme observed in the studies about nursing staff's attitude was the need for alternative interventions to maintain the safety of patients and staff on psychiatric wards.

The shift from the treatment to the safety paradigm is a key factor in the need for alternatives. Despite the negative consequences and feelings, nurses feared elimination of coercive measures as a tool for dealing with aggressive behaviour and expressed concerns that society will blame them in the future for using coercion and for the negative consequences of not using coercion (72). Because of the perceived necessity of using coercive measures, alternative interventions are vital to align with the ambition to diminish

their use from mental health care. Specifically, nurses seem to perceive the severity of coercive interventions as something that needs attention.

Nurses expressed the desire for more “gentle” interventions to manage patients’ behaviour (55). To make coercion more humane, nurses believed that the practice of coercive measures needed to improve, for example by making the seclusion room more comfortable (37, 67, 77). Several studies recognised that nurses view seclusion and restraint only as appropriate as intervention of “last resort”, when other interventions have failed (38, 42, 49, 57, 59, 64, 66, 69, 77-81). However, the concept of “last resort” is unclear and some staff members viewed the point that an intervention is “of last resort” earlier than others did (64, 67). Seclusion and restraint have major impact on the patient and nurses were generally concerned about their wellbeing when applying these interventions (60, 63).

Although seclusion and restraint are both seen as highly intrusive, several authors reported that nurses viewed seclusion and forced medication as less intrusive and thus, favourable compared to mechanical restraint (48, 65, 66, 77). Other authors stated that nurses preferred the use of the least intrusive intervention when considering the use of coercive measures, such as pro re nata (PRN or as needed) medication (43, 57, 68, 79, 82, 83) and close observation or individual counselling (42, 53, 54, 82).

The frequency of use also influenced the perceived intrusiveness of coercive interventions. Whittington, Bowers (34) used the sample of City-128 to assess the view of nurses towards eleven forms of coercive measures (locked-door seclusion, open-area seclusion, mechanical restraint, physical restraint, net bed, transfer to a psychiatric intensive care unit (PICU), time out, constant observation, intermittent observation, consensual PRN medication, compulsory intramuscular medication) on six domains (effectiveness, acceptability, respectfulness, safety for service users, safety for staff and willingness to use the measure). The three interventions with least approval of staff were net beds, mechanical restraint and open area seclusion. These interventions were not (net beds and mechanical restraint) or seldom (open area seclusion) used in mental health services in the UK. The three methods with most approval (transfer to the PICU, PRN medication and observation) were considered common practice (34). Therefore, nurses showed low rates of approval for coercive measures they seldom or never use and report more favourably on familiar practices. Özcan,

Bilgin (84) supported this finding. They found a correlation between the frequency of use of coercive measures and positive attitudes towards the coercive measure. Van Doeselaar, Slegers (85) found that nurses who are more actively involved in use of seclusion had less ethical concerns for seclusion than non-involved professionals are, such as psychologists and therapists. Gerace and Muir-Cochrane (65) suggested that nurses were supportive towards the elimination of mechanical restraint use because they use it less frequently than other coercive measures. Dahan, Levi (86) reported that participants who were present during mechanical restraint practices had more positive attitudes than participants who were never present. Pettit, Bowers (87) found that availability of a coercive measure was associated with approval of the use of the coercive measure. For example, access to a seclusion room was associated with greater acceptability of seclusion as a method of containment (87).

In sum, nurses consider seclusion and restraint generally as most intrusive interventions and express the need for less intrusive alternatives to diminish their use. The attitude of nurses towards specific coercive measures seems more positive for interventions used more frequently in practice.

Influence of nursing staff characteristics

Next, we summarise the results of the quantitative studies on the influence of nursing staff characteristics (individual, professional and organisational) on the use of and attitude towards coercive measures.

Individual characteristics

Gender of the nurse is the most reported nursing staff characteristic associated with use of and attitude towards coercive measures, although findings are inconsistent. Several studies reported that the presence of male nurses was associated with more use of coercive measures, such as seclusion (29, 52, 88) or restraint (89). Male nurses also showed more positive attitudes than female nurses towards coercive measures (34, 36, 68, 90-92). Male nurses were found to be more supportive of coercive measures after “bad behaviour” or damaging property (37, 57). However, other studies reported that the presence of female nurses was associated with more seclusion (93, 94) or restraint (95) and that female gender is associated with more positive attitudes towards coercive measures (60, 96-98). Bowers,

Stewart (33) reported that wards with high levels of aggression and low use of coercive measure seemed to have less female staff members. Other studies found no associations in (multivariable) analysis between gender of the nurse and use of coercive measures (28, 99-102).

Several authors investigated nurses' age in relation to use of seclusion, but found no associations (32, 89, 99, 100). Some authors reported that young age was associated with more positive attitudes towards seclusion (37, 60) or coercive measures in general (36), although an opposite effect was found for physical restraint (60).

The City-128 study investigated ethnicity of the nurse and found that the proportion of white staff members in a team was associated with more use of coercive measures, compared to African and other ethnicities (28). De Benedictis, Dumais (99) examined the role of religion and non-native Canadian nurses and found no associations on both accounts. The variables physical stature and BMI were both reported as not associated with seclusion (100).

A creative personality, measured on Gough's Adjective Checklist (103), and high leadership scores, measured on Kolb's Organizational Climate Questionnaire (104), were found to be associated with less initiation of coercion (105). High scores on transactional leadership, measured as a subscale of the Multifactor Leadership Questionnaire (106), were also found to be associated with less use of coercive measures (28). Staff members with high empathy scores (scored on a scale of one (below average empathy) to five (above average empathy)) were less prone to use seclusion and restraint (107). Happell and Koehn (38) reported that approval of seclusion for deviant patient behaviour was associated with high scores of emotional exhaustion (measured with the Maslach Burnout Inventory (MBI) (108)) and low scores of therapeutic optimism (nurses' optimism related to treatment outcomes for patients, measured with the Elsom Therapeutic Optimism Scale (109)). There was no association between anger of nurses and the incidence of seclusion and restraint (110). Bowers (28) did not find an association between score on the MBI and the use of coercive measures.

Feelings of safety of nurses were likely to be associated with the use of coercive measures, although definition and measurement is complicated. Moreover, direction of causality is

mostly unknown. Higher subjective feeling of safety of nurses was associated with less seclusion (102). These authors measured the feeling of safety at the end of each shift. Therefore, an aggressive incident that led to seclusion during the shift may have caused a lower feeling of safety. The feeling of safety was negatively influenced by physical environment (e.g. lack of safety equipment), organisational factors (e.g. low staff-patient ratio), lack of communication with hospital security, patient characteristics and trust within teams, while aggression management training, work experience and information about patients contributed to the feeling of safety (49). Goulet and Larue (49) also described that being a victim or witness of patient assault made nurses feel less safe and may even induced hypervigilance. Gray and Diers (111) suggested that a decrease of staff stress and increase of feelings of control by staff was associated with an increase in the use of coercive measures, while referring to the “reverse hypothesis” (patient will not act out when staff members are upset). These authors measured staff stress and coercive measures before and after a major organisational change, making it likely that the organisational change caused confounding. Nurses that were assaulted and injured by patients decided to use restraint later in the course of an aggressive incident than nurses that were never injured by patients (112). A positive attitude towards patients with personality disorders was associated with less seclusion, but not with other forms of coercion (28, 29, 32).

Professional characteristics

Several authors investigated the educational level of nurses in relation to the use of coercive measures. The City-128 study divided staff members into qualified and non-qualified staff. Wards with more qualified staff were associated with more use of seclusion (29). This seemed also to be the case for mechanical restraint (32). Khalil, Al Ghamdi (68) also reported that higher level of nursing education is associated with more use of seclusion. However, Miodownik, Friger (113) reported a negative association between the presence of academic registered nurses and the duration of coercive measures. The presence of student nurses on a ward was also associated with more mechanical restraint (32). However, most studies that incorporated educational level of nurses in their model found no association with the use of coercive measures (89, 94, 95, 99, 100).

Several authors reported no association between the work experience of nurses and the frequency of use of coercive measures (68, 89, 94, 99-101). Janssen, Noorthoorn (94) found an association between more variability in the nursing team of a shift and less frequent use of seclusion. Morrison and Lehane (88) suggested that more experienced nurses [“charge nurses”] might be associated with less use of seclusion, although they did not perform any statistical testing. Some authors suggested that experienced nurses tended to have less supportive attitudes towards the use of coercive measures (37, 47, 57). However, Gandhi, Poreddi (96) and Bregar, Skela-Savic (90) reported more positive attitudes for restraint of nurses with more work experience. Mann-Poll, Smit (71) found that experienced nurses rated the use of seclusion equally appropriate and necessary, while less experienced nurses showed more ambivalence in necessity and appropriateness.

There is no evidence for an association between the amount of fulltime nurses in a team (99, 100), the length of time that nurses are working at the ward (100) or their training in aggression management (68, 99) and the frequency of use of coercive measures.

Organisational characteristics

Staff-patient ratio has received extensive attention in scientific research in the last thirty years. Several authors reported an association between a lower staff-patient ratio (i.e. less staff members for each patient) and an increase of the use of coercive measures (88, 93, 101, 114). On the contrary, Bowers and Crowder (31) found that more qualified staff members in the shifts and in the shifts prior to the incident was associated with more frequent use of coercive measures. Fukasawa, Miyake (115) found a small association between higher staff-patient ratio and an increase of the use of seclusion and restraint. Other authors found no association for staff-patient ratio and the use of coercive measures (28, 29, 32, 35, 68, 89, 94, 102, 107, 116) or reported no outcome measurement despite the fact that they mentioned measuring this variable in the method section (117). Klimitz, Uhlemann (118) reported no association between the use of restraint and shortage of nursing staff. The staff-patient ratio varied in most studies of different shifts (day, evening and night). According to Klimitz, Uhlemann (118) and Morrison and Lehane (88), the night shift has the least use of coercive measures compared to the other shifts. However, other studies found that the night shift has most use of coercive measures compared to other

shifts (93, 101). Several authors claim that most coercive measure occurred during the evening shift (89, 118, 119). Yang, Hargreaves (107) report substantial higher odds of seclusion in evening, weekend or holiday shifts compared to weekday shifts, but no difference between night shifts and weekday shifts. O'Malley, Frampton (101) found no difference of the use of seclusion and the day of the week. Reitan, Helvik (119) reported most frequent use of pharmacological restraints during summer and most use of mechanical restraint during spring.

De Benedictis, Dumais (99) found that seclusion and restraint occurred more at psychiatric emergency departments or intensive care units than at regular psychiatric wards, but less frequent in non-teaching hospitals compared to teaching hospitals. The availability of (and compliance to) aggression management protocols was not associated with the use of seclusion and restraint (99). Changing a twenty-bed unit into two ten-bed units (while holding the staff-patient ratio stable) seemed to decrease the use of seclusion, suggesting that deviant patient behaviour can be managed better at small wards (101).

A higher score on the subscale program clarity of the Ward Atmosphere Scale (120), indicating an effective structure on the ward, was associated with less use of coercive measures (28, 32). Bowers, Nijman (30) divided a sample of 134 wards into two clusters based on their scores on leadership, teamwork, ward atmosphere, burnout levels and attitude towards patients with a personality disorder. The cluster with the highest (positive) scores (n = 78) showed less use of coercive measures compared to the clusters with lowest scores (n = 56).

Other authors found no association between ward atmosphere and frequency of use of coercive measures (52, 118). Bowers (28) found no association between team climate and the use of coercive measures, contrary to De Benedictis, Dumais (99) who reported an association of the subscale anger and aggression of the Group Environment Scale (121) and the use of seclusion and restraint.

Discussion

This systematic review aimed to summarise the scientific literature on attitudes of nurses towards coercive measures and on the association between nursing staff characteristics and

the use of coercive measures and the attitude of nurses towards coercive measures in acute mental health services.

With respect to the first aim, we observed two major themes to in the attitude of nurses towards use of coercive measures. Firstly, the abandonment of a treatment paradigm towards a safety paradigm. In the therapeutic paradigm nurses considered coercive measures as harsh, but helpful for, e.g. calming the agitated patient and protecting patients' dignity (41, 42, 51). The support for the therapeutic paradigm in the attitude of nurses decreased substantially in the last decades and shifted to the safety paradigm. In the safety paradigm, staff members consider coercive measures a measure of last resort and there is a preference for the least intrusive intervention. This resulted in a strong conflict for nurses, because they consider coercive measures as necessary, but its application inflicts strong negative feelings. This finding is in line with other reviews on attitude towards coercion (19, 20). Most current research on the attitude of nurses towards coercion show that nurses viewed coercive measures mainly from the safety paradigm, although the therapeutic paradigm in the attitude of nurses has not disappeared completely (122).

The second theme was an expressed need for less intrusive alternative interventions. The increase of the need for less intrusive interventions is consistent with the attitude change to the therapeutic paradigm. Coercive measures are seen as (in the words of Bigwood and Crowe (61)): "undesirable, but unavoidable". However, the perspective on what is a "less intrusive alternative intervention" shows to be dependent of several contextual factors. We found that some nurses that used mechanical restraint as intervention of last resort tended to consider seclusion as a less intrusive alternative intervention (48, 65, 66, 77), while nurses from other studies consider seclusion as highly intrusive and undesirable intervention (44, 45, 52, 62). The impact of seclusion on patients is confirmed by Askew, Fisher (123), who conclude that patients feel vulnerable, neglected and abused when experiencing seclusion. Nevertheless, both restraint and seclusion are the "ultimum remedium" in case of acute dangerous situations on psychiatric wards and most nurses wish to use alternative interventions with less impact on the patient (42, 53-55, 82). The everyday experience of the nurse with coercive measures in clinical practice seems to have major influence on the perception of intrusiveness and therefore, on the appropriateness of an intervention as alternative. A hypothetical explanation of this finding is that the positive attitude makes

nurses choose for that specific coercive measure when necessary. However, there are major differences between countries in the use of coercive measures (6), which makes it unlikely that nurses based their attitude on these differences instead of on history and culture. Another hypothetical explanation is given by Van Doeselaar, Slegers (85), suggesting that the frequency of use of a specific intervention can blind the nurses for possible negative consequences and thereby the perceived “intrusiveness” of an intervention drops. This could explain the association between a positive attitude and the frequency of use of a specific coercive measure (34, 84). This theory is in line with Laiho, Kattainen (17), who stated that the threshold to use coercion gets lower when it was accepted as measure to control behaviour. However, the inconsistent findings on the influence of experience of the nurse on seclusion might indicate that acceptance of coercive measures is also influenced by knowledge of and confidence in using alternative interventions. We recommend further exploration of this issue in future research to reveal a possible blind spot of nurses in their attitude towards coercion and coercive measures.

Our second aim was the influence of nursing staff factors on the use of coercive measures and on the attitude of nurses towards coercive measures. The results in literature were remarkably inconclusive. For example, we found twelve studies that investigated the association of gender of the nurse and the use of coercion. Five of them concluded that male nurses were more prone to use coercion (29, 52, 68, 88, 89); three of them concluded that female nurses were more prone to use coercion (93-95) and four of them found no effect in multivariable analysis (30, 99, 100, 102). Findings on the influence of the attitude towards coercive measures showed similar pattern, male gender was associated with more positive attitudes by six studies (34, 36, 68, 90-92) and also associated by four studies with more negative attitudes (60, 96-98). Beghi, Peroni (16) concluded in their review that male staff were associated with more restraint; our findings show that this conclusion might have been too firm. We found no conclusive evidence for an association of age, religion or the physique of the nurse and the use of coercion (28, 89, 99, 100). Some authors reported an association between personality factors and use and attitude of coercive measures, but the current studies are too small and inconsistent in methodology to draw conclusions. In addition, professional characteristics such as work experience, proportion full time workers, time working at the ward or level of training in aggression management showed no clear

association with the prevalence of coercion (68, 89, 94, 99-101). Some studies show that experienced nurses had less positive attitudes on the use of coercive measures, but these results also are equivocal (37, 47, 57, 71, 90, 96). However counterintuitive, several authors suggested that better qualified nurses were associated with more use of coercive measures (29, 32, 68). A possible explanation is that wards with more qualified nurses serve a more complex patient population. Again, most authors report no association of nurses' educational level and the use of coercion (89, 94, 95, 99, 100). Some authors reported that higher staff-patient ratios were associated with less coercion (88, 93, 101, 114), but most studies reported no association between these factors (28, 29, 32, 35, 68, 94, 102, 107, 116).

When combining the findings of the perceived necessity of coercive measures for safety reasons and the inconsistency in the influence of nursing staff characteristics, we want to stipulate the possible importance of the feeling of safety of nurses. Despite the troubles of measuring this trait, some authors suggest that the feeling of safety of nurses may be associated with less use of coercive measures (49, 102). This is in line with the findings of the nurses' attitude towards coercion. Nurses that feel unsafe may very well view a coercive measure as necessary to restore safety, while nurses that feel safe may settle for alternative (less coercive) interventions. This is in line with the findings of Cusack, McAndrew (124) that staffs' fear motivates for the use of coercion. Happell, Dares (67) and Wilson, Rouse (64) reported nurses that were concerned that some nurses considered the necessity of a "last resort intervention" earlier than others did. Feelings of safety or danger are not objective constructs, so interpersonal differences in perception and perspective highly affect the treatment of patients when potential dangerous situations occur. The attention of professionals, researchers and policy makers on the interpretation of the concepts of safety and danger could be crucial for taking next steps in reducing coercive measures.

This current systematic review is, to the best of our knowledge, the first to combine a review on the attitude of nurses and the influence of nursing staff characteristics explicitly. The strengths are that we performed an extensive literature search in several databases and to several forms of coercive measures, instead of focussing on seclusion and restraint. There are also some limitations. Summarising qualitative studies inevitably entails de-contextualisation of qualitative findings, because of the dependency of qualitative research findings on the particular context, time and group of participants (125). The heterogeneity

and methodological limitations of the studies on nursing staff characteristics in associations with coercive measures made it impossible to perform a meta-analysis. Another limitation is that the concept of attitude is not well defined and that several authors use other words to describe attitude. In our search, we also evaluated studies on perspectives, experiences and views of nurses to find additional studies on this matter. There were also specific limitations applicable to individual studies. The studies were of moderate to low methodological quality, which hinders the validity of the results of this review. Another limitation is that authors tend to report only significant associations or large effect sizes. Because of that, we cannot rule out the underreporting of some characteristics due to publication bias. We extracted the data from manuscripts as thoroughly as possible to summarise all reported (non-significant) results in our study.

Conclusion

The attitude of nurses towards coercive measures has changed over the years from a therapeutic paradigm to a safety paradigm. The current attitude towards use of coercive measures is not to treat patients, but to protect patients and staff from violence. Nurses consider coercive measures as necessary interventions and express the need for less intrusive alternatives. Although nurses recognize the negative consequences for patients, the frequent use of a specific coercive measure may decrease the value that nurses give to the negative consequences associated with that measure. The research on the influence of nursing staff characteristics is highly inconclusive. However, the feeling of safety of nurses may be a key concept in the prevention of coercive measures.

Implications for practice

We propose that mental health care could improve the focus on the constructs of safety and danger to protect patients from unnecessary use of coercive interventions. Lack of attention to the feeling of safety of nurses working at psychiatric wards can threaten further reduction of use of coercive measures. Using coercive measures has been common practice in mental healthcare for centuries, as well as the debate on reducing them (126). It is part of our culture and, “culture eats strategy for breakfast” (127). It is important to invest in the feeling of safety of nurses to help them cope with changing the policy on using coercive measures.

Evidence-based intervention programs such as Safewards (13) and Six Core Strategies (128) can help nurses gain confidence in doing their job. To develop specific strategies to improve these feelings could be an interesting topic for researchers in the mental health field.

Improvement of patient safety relies on qualified nurses that feel safe and are equipped for the difficult task they are facing when working in acute clinical psychiatry.

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Conflict of interest & funding

The authors declare no conflicts of interest. No specific funding was used for this study.

Online supplement 5.1: Full search strategy

Ovid MEDLINE(R) ALL <1946 to March 13, 2019>

Search date: 14 March 2019

#	Search	Results
1	patient isolation/ or exp behavior control/ or exp immobilization/ (((medication or medicalization) adj3 (involuntary or force?)) or coerc* or seclusion or	31065
2	segregation or restraint or isolation or solitary confinement or forced treatment or control intervention?).ab,kf,ti.	304766
3	or/1-2 [restraint]	327978
4	inpatient/ and (psychology.fs. or psychiatr*.mp.)	7082
5	(psychiatr* adj2 inpatient?).ab,kf,ti.	7130
6	or/4-5 [psychiatric inpatients]	12971
7	((mental or psychiatric) adj3 (unit? or hospital? or department? or ward?)).ab,kf,ti.	24669
8	hospitals, psychiatric/ or psychiatric department, hospital/	30478
9	or/7-8 [psychiatric facilities]	43001
10	exp nursing care/ or exp nurses/ or nurse patient relation/ or nurse's role/ or exp nursing/	366160
11	nursing.fs.	130151
12	(nurse? or nursing or personnel or staff or aide?).ab,kf,ti.	612936
13	or/10-12 [nursing]	823287

14	exp psychiatry/ or exp mental health/ or mental health services/	157303
15	psychology.fs.	976738
16	(psychiatr* or mental health or psychology).ab,kf,ti.	380980
17	or/14-16 [psychiatry]	1294874
18	13 and 17	166260
19	psychiatric aides/ or psychiatric aide?.ab,kf,ti.	431
20	18 or 19 [psychiatric nursing]	166504
21	(6 or 9) and 13	10516
22	20 or 21	167750
23	3 and 22	3324
24	eunomia.ab,kf,ti.	23
25	23 or 24	3345
26	animals/ not humans/	4523435
27	25 not 26	3312
28	remove duplicates from 27	3312

Ovid Embase Classic+Embase <1947 to 2019 March 13>

Search date: 14 March 2019

#	Search	Results
1	behavior control/ (((medication or medicalization) adj3 (involuntary or force?)) or coerc* or seclusion or	4012
2	segregation or restraint or isolation or solitary confinement or forced treatment or control intervention?).ab,kw,ti.	378668
3	or/1-2 [restraint]	382510
4	hospital patient/ and (psycholog*.mp. or psychiatr*.ec.)	16556
5	(psychiatr* adj2 inpatient?).ab,kw,ti.	9267
6	or/4-5 [psychiatric inpatients]	23615
7	psychiatric department/	8183
8	((mental or psychiatric) adj3 (unit? or hospital? or department? or ward?)).ab,kw,ti.	33492
9	or/7-8 [psychiatric facilities]	36902
10	nursing staff/ or nursing assistant/ or exp nursing/ or nurse patient relationship/ or nurse attitude/	449786
11	(nurse? or nursing or personnel or staff or aide?).ab,kw,ti.	756995
12	or/10-11 [nursing]	959101
13	exp psychiatry/ or exp mental health/ or mental health care/ or mental health service/ or exp mental hospital/ or exp psychiatric nursing/	366492
14	psychiatry.ec.	993008
15	(psychiatr* or mental health or psychology).ab,kw,ti.	510934

16	or/13-15 [psychiatry]	1396766
17	12 and 16	76959
18	psychiatric aide?.ab,kw,ti.	71
19	17 or 18 [psychiatric nursing]	76959
20	(6 or 9) and 12	10958
21	19 or 20	78649
22	3 and 21	2248
23	eunomia.ab,cn,kw,ti.	38
24	22 or 23	2284
25	(animal/ or animal experiment/ or animal model/ or nonhuman/) not human/	6098322
26	24 not 25	2259
27	remove duplicates from 26	2239

Ovid PsycINFO <1806 to March Week 1 2019>**Search date: 14 March 2019**

#	Search	Results
1	involuntary treatment/ or coercion/ or exp social isolation/ or physical restraint/	12144
2	((medication or medicalization) adj3 (involuntary or force?)) or coerc* or seclusion or segregation or restraint or isolation or solitary confinement or control intervention?).ab,id,ti.	54775
3	or/1-2 [restraint]	58562
4	hospitalized patients/	12433
5	(inpatient? or hospitalized patient?).ab,id,ti.	51047
6	or/4-5 [psychiatric inpatients]	56171
7	psychiatric units/ or psychiatric hospitals/ or (*hospitals/ and *psychiatry/)	9592
8	((mental or psychiatric) adj3 (unit? or hospital? or department? or ward?)).ab,id,ti.	26750
9	"3379".cc.	28978
10	or/7-9 [psychiatric facilities]	50848
11	exp psychiatric hospital staff/ or psychiatric nurses/ or exp health personnel attitudes/	26061
12	((mental or psychiatric) and (nurse? or nursing or personnel or staff or aide?)).ab,id,ti.	40492
13	or/6,10-12 [psychiatric nursing]	141860
14	3 and 13	3745
15	eunomia.ab,id,ti.	20
16	14 or 15	3753
17	remove duplicates from 16	3747
18	limit 17 to ("0100 journal" or "0110 peer-reviewed journal" or "0400 dissertation abstract")	3478

CINAHL Plus with Full Tekst (Ebscohost)**Search date: 14 March 2019**

#	Search	Results
1	(MH "Coercion") OR MH immobilization AB (((medication or medicalization) N2 (involuntary or force?)) or coerc* or seclusion or segregation or restraint or isolation or solitary confinement or forced treatment or control intervention?) OR TI (((medication or medicalization) N2 (involuntary or force?)) or coerc* or seclusion or segregation or restraint or isolation or solitary confinement or forced treatment or control intervention?) OR SU (((medication or medicalization) N2 (involuntary or force?)) or coerc* or seclusion or segregation or restraint or isolation or solitary confinement or forced treatment or control intervention?)	5043
2	forced treatment or control intervention?)	40322
3	S1 OR S2	43541
4	(MH inpatients AND MH mental health) or MH psychiatric patients AB (psychiatr* N2 inpatient?) OR TI (psychiatr* N2 inpatient?) OR SU (psychiatr* N2 inpatient?)	10736
5	inpatient?) (MH "Hospitals, Psychiatric") OR (MH "Psychiatric Nursing+") OR (MH "Nursing Assistants")	980
6	OR MH psychiatric units AB (((mental or psychiatric) N2 (unit? or hospital? or department? or ward?)) or psychiatric aide?) OR TI (((mental or psychiatric) N2 (unit? or hospital? or department? or ward?)) or psychiatric aide?) OR SU (((mental or psychiatric) N2 (unit? or hospital? or department? or ward?)) or psychiatric aide?)	35680
7	ward?)) or psychiatric aide?)	10009
8	S4 OR S5 OR S6 OR S7	45205
9	S3 AND S8	1619
10	AB eunomia OR TI eunomia OR SU eunomia	3
11	S9 OR S10	1620

Online supplement 5.2: Overview included studies

Available online at the journals website:

<https://onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1111%2Fjpm.12586&file=jpm12586-sup-0002-DataS2.xlsx>

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CHAPTER 6

Nursing staff factors contributing
to seclusion in acute
mental health care

– an explorative cohort study

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Abstract

BACKGROUND Seclusion is a controversial intervention. Efficacy with regard to aggressive behaviour has not been demonstrated and seclusion is only justified for preventing safety hazards. Previous studies indicate that nursing staff factors may be predictors for seclusion, although methodological issues may have led to equivocal results.

OBJECTIVE To perform a prospective cohort study to determine whether nursing staff characteristics are associated with seclusion of adult inpatients admitted to a closed psychiatric ward.

METHOD We studied the association between nurses' demographics and incidence of seclusion during every shift. Data were collected during five months in 2013. Multiple logistic regression was used for analysis.

RESULTS In univariable analysis, we found a non-significant association between seclusion and female gender, OR (95% CI) = 5.27 (0.98 – 28.49) and a significant association between seclusion and nurses' large physical stature, OR = 0.21 (0.06 – 0.72). We found that physical stature is the most substantial factor, although not significant: OR_{adjusted} = 0.27 (0.07 – 1.04).

CONCLUSION Nurses' gender may be a predictor for seclusion, but it seems to be mediated by the effect of physical stature. We used a rigorous, census-based, prospective design to collect data on a highly detailed level and found a large effect of physical stature of nurses on seclusion. We found nurses' physical stature to be the most substantial predictor for seclusion. These and other factors need to be explored in further research with larger sample size.

Introduction

Background

Seclusion is an intervention still widely used in mental health care (1, 2). There are large differences in the use of seclusion or other coercive interventions across countries in Europe (1, 3, 4). Serious safety hazards in psychiatric hospitals - such as aggression and violence of patients against staff, fellow patients or goods - are the main reason to use coercive interventions (5).

Seclusion is a controversial intervention and therapeutic effects have never been shown (6-8). On the contrary, patients reported negative effects such as anxiety, anger, feelings of being abandoned and traumatic experiences of being secluded (9-11). Even in healthy subjects, seclusion causes feelings of anxiety and suspicion (12). For this reason, the Dutch Ministry of Health, Welfare and Sports ordered in 2004 that Dutch mental health care should decrease seclusion rates by at least 10% each year (13). The use of seclusion and duration of seclusion episodes decreased more than 50% in 2012 compared to 2008 (2). In 2012, 6.5% of the patients admitted in a psychiatric hospital in the Netherlands were secluded during their hospital stay, with a median duration of 17.7 hours per seclusion-episode (2). The Dutch Mental Health Act only permits seclusion in case of severe danger on a psychiatric ward due to aggressive or violent behaviour of patients and the coercive measures must be used proportional, as short as possible, safe, humane and respectful (14).

Several studies reported factors associated with seclusion in mental health care, which can be categorized into patient, nursing staff and unit characteristics. Larue, Dumais (15) identified younger age, male gender and diagnosis of schizophrenia or bipolar disorder as patient characteristics associated with a higher risk of being secluded during an admission. Vruwink, Noorthoorn (16) and Tunde-Ayinmode and Little (17) also found a younger age of patients to be associated with a higher risk of being secluded. Furthermore, aggression during previous admissions or prior to the current admission and involuntary admission are found to be associated with being secluded (16). Findings concerning the effect of nursing staff and unit characteristics on seclusion are equivocal. Nijman, Duangto (18) found no significant associations between seclusion and the nurses' gender, years of experience and patient-staff ratio in a closed long-stay psychiatric ward. Vollema, Hollants (19) reported

significant associations between seclusion and the subjective feelings of safety among nurses (OR = 1.77, $p = .005$). In essence, when nurses felt safer they were less likely to seclude a patient. Janssen, Noorthoorn (20) found male-female staff ratio and variability in the amount of professional experience in a team to be significantly associated with seclusion rates. More female nurses and low variety in the experience as a psychiatric nurse resulted in higher seclusion rates. On the other hand, Bowers, Van der Merwe (21) reported that seclusion was significantly associated with more male nurses on duty (IRR = 1.30, $p < .05$). Furthermore, lower patient/staff ratios were significantly associated with seclusion (17, 22), but not all authors found this association, e.g. Vollema, Hollants (19) and Husum, Bjorngaard (23). These studies, however, all had methodological limitations, such as a retrospective or cross-sectional design and/or small sample size. Summarizing, previous studies indicate that not only patient, but also nursing staff factors may be predictors for seclusion, although methodological issues may have led to equivocal results.

Objective

The objective of the study was to perform a prospective study to determine whether nursing staff characteristics are associated with seclusion of adult inpatients admitted to a closed psychiatric ward.

Methods

Study design

We conducted a naturalistic prospective cohort study. The manuscript was drafted using the STROBE reporting guidelines.

Ethical considerations

In our study, we used only anonymised data obtained from the patients' medical chart. Data could not be traced back to an individual patient nor nurse. The nursing staff was informed about the study confidentiality and about the option not to reveal their personal information. By filling in the case record form, the nurses gave their consent to the use of their anonymised details. The Medical Ethics Review Committee reviewed our study protocol

and decided that no ethical approval was required according to the Dutch Medical Research Involving Human Subject Act (WMO).

Setting & participants

The study was conducted at a closed admission ward on the psychiatric department of an academic hospital in a major city in the Netherlands.

All nurses working in the ward and all patients admitted to the ward during the data collection period were included in our study. The ward consists of two separate units and each unit consists of six patient rooms and one seclusion room located outside the ward. Each patient has a private bedroom and bathroom. Both units have their own living room, conversation room, kitchen and a room where patients are allowed to smoke cigarettes. Both units have access to a central garden. The nursing station is situated at the centre of the ward and serves both units. Patients who are secluded are monitored closely; nurses check on them at least every 15 minutes (by camera or through a window in the door) and visit them regularly for basic care and activities.

The nurses at the ward are registered in the Dutch registration of healthcare professionals. All registered nurses are trained every six months in techniques of verbal de-escalation, safe physical restraint and the care for patients in seclusion rooms. Student nurses are included in our study, but always work on a supernumerary basis. Patients were aged 18 – 65 years and were mostly admitted to the ward on an involuntary basis, because of acute danger for the patient or their surroundings, due to their psychiatric condition.

Data collection & variables

Data were collected between January 1st 2013 and June 30th 2013. Our sample size was dependent on the admission rates and the number of nurses at the ward. By including all nurses and patients, we maximised the possible sample size for this study. For the current study, we wanted to include at least 20 incidents.

In the Netherlands, seclusion is defined as the restraint of a patient for care and treatment in a designated seclusion room (containing only a mattress and a blanket) approved by the Dutch Health Care Inspectorate (14). Nursing staff characteristics were obtained by a case

record form (gender, age, length, weight, registered nurse y/n, level of education, level of employment, years of employment, years of experience in mental health care, years of experience with seclusion, permanent staff/temporary staff, nurse manager y/n, senior nurse y/n).

To assess whether a large or small physique of the nurse was a predictor of seclusion, we categorized 'physical stature,' into 3 categories: small (smaller than a same sex person of similar age), average (comparable to a same sex person of similar age) and large (larger than a same sex person of similar age), based on length, weight and (observed) physique. Physical stature was visually determined by two independent assessors, because of the subjective nature of this variable. They assessed the nurses by looking at length, weight, and width, to determine whether the nurse had a small, average or large stature. The assessors had a substantial interobserver agreement (Cohen's $\kappa = .74$) (24). Consensus between both assessors was reached for the remaining cases. Patient characteristics were obtained from the electronic patient record and used to correct for possible confounding due to patient variance.

Data were collected three times every 24 hours at each turn of the shift. We selected these variables based on suggestions in existing literature on this subject (17-23, 25) and based on our own hypothesis that nurses' stature may be an important factor.

The dependent variable (involuntary seclusion) was measured at patient level and the predictor variables of interest were measured at nursing staff and unit level. Seclusion data were obtained from the Argus registration system, which contains information on involuntary admissions and coerced treatment. Its use is obligatory for every psychiatric hospital in the Netherlands. Argus provides reliable information of the number and duration of seclusions on the ward (26). No voluntary seclusion was used on the ward during the study period.

Analysis

To assess staff characteristics predicting seclusion we used a two-step approach proposed by Hosmer and Lemeshow (27).

In the first step, we selected the predictors for the multiple logistic regression analysis. In this step, separate univariate logistic regression analyses with seclusion as dependent variable were conducted for each potential predictor. Nursing staff characteristics were collected for the nursing team working at the ward on shift level. The nursing staff characteristics are analysed in an aggregated manner. A propensity score is the predictive value of group membership and can be used to correct for multiple possible confounders (28). The propensity score is found by predicting the exposed group membership from the patients' baseline characteristics by a logistic regression analysis and added to the prediction model.

Predictors with a p-value < .20 in the first step were selected for the second step. In this second step, a multiple logistic regression model was conducted with the selected predictors of the first step and the propensity score. SPSS, version 19 (SPSS Inc. USA) was used for all analyses.

Bias

Staff participants were blinded for the hypotheses of our study to prevent performance bias. Patients at the ward were unaware of the study being performed. We included all patients and staff members at the ward to prevent selection bias. Our primary endpoint (involuntary seclusion) is an explicit, dichotomous endpoint, suitable for logistic regression analysis. We use multiple logistic regression analysis to correct for any confounding variables. We are conservative in using independent variables in our logistic regression model to prevent the model from overfitting.

Results

Participants

The total group of nurses (n = 47) consisted of subgroups of permanent staff of registered nurses (n = 20), registered nurses with a temporary employment (n = 18) and student nurses (n = 9). Nurses were mostly female (61.7%) with a median age of 35.8 years. Twelve of the nurses worked full time (25.5%). The nurses worked for a median of 2.8 years at the ward and had a median of 4 years of experience in clinical mental health care (**Table 6.1**).

In our sample data was missing for 2 nurses, each of them was present in one shift during our study period. We could not assess the physical stature of 4 nurses, because these participants worked at the ward for a very short period.

Table 6.1: Nursing staff characteristics (n = 47)

Registered nurse, % (n)	80.9 (38)	Employment rate (hours per week), % (n)	
Male, % (n)	38.3 (18)	36 hours or more (full time)	25.5 (12)
Age (years), md (IQR)	35.8 (26.0)	20 – 32 hours	49.0 (23)
Length (centimetres), mean (SD)	174.3 (9.2)	20 hours or less	25.5 (12)
Weight (kilograms), mean (SD)	72.6 (13.6)	Employment at the ward (years), md (IQR)	2.8 (5.5)
Body Mass Index, mean (SD) [†]	23.8 (3.6)	Experience in mental health care (years), md (IQR)	4.0 (18.8)
Physical stature, % (n)		Experience with seclusion (years), md (IQR)	4.5 (13.5)
Small	17.0 (8)	Permanent staff, % (n)	
Average	53.2 (25)	Temporary staff	36.2 (17)
Big	17.0 (8)	Permanent staff	42.6 (20)
Educational level, % (n)		Permanent staff on other ward	21.3 (10)
Student	14.9 (7)		
MBO (EQF4/5)	25.5 (12)		
HBO (EQF 6)	53.2 (25)		

[†] = weight/length²

Patients who were secluded more often were admitted after an aggressive incident ($p = .010$) or admitted for the first time to a psychiatric hospital ($p = .002$). Patients who were secluded also had (surprisingly) significantly higher scores in the Global Assessment of Functioning (GAF) compared to the patients who were not secluded during their admission ($p = .004$) (**Table 6.2**).

Table 6.2: Patient characteristics (n = 48)

	Total patients n = 48	Secluded patients n = 13	Non-secluded patients n = 35	p
Male, % (n)	56.3 (27)	61.5 (8)	54.3 (19)	.785 ⁺
Age (years), md (IQR)	37.2 (23.8)	46.8 (32.2)	35.9 (22.2)	.486 ⁺⁺
Length admission (days), md (IQR)	19.0 (24.5)	21.5 (27.8)	14.0 (21)	.384 ⁺⁺
Dutch citizen, % (n)	75.0 (36)	69.2 (9)	77.1 (27)	.864 ⁺
Involuntary admission, % (n)	77.1 (37)	92.3 (12)	71.4 (25)	.126 ⁺
White European ethnicity, % (n)	45.8 (22)	61.5 (8)	40.0 (14)	.660 ⁺
Primary diagnosis, % (n)				.456 ⁺
Psychotic disorder	77.1 (37)	76.9 (10)	77.1 (27)	
Bipolar disorder	8.3 (4)	15.4 (2)	5.7 (2)	
Major depressive disorder	6.3 (3)	7.7 (1)	5.7 (2)	
Other	8.3 (4)	0	11.4 (4)	
Substance abuse as secondary diagnosis, % (n)	43.8 (21)	46.2 (6)	42.9 (15)	.975 ⁺
Personality disorder as secondary diagnosis, % (n)	8.3 (4)	7.7 (1)	8.6 (3)	.758 ⁺
Intellectual impairment as secondary diagnosis, % (n)	10.4 (5)	7.7 (1)	11.4 (4)	.781 ⁺
Seclusion in patient history, % (n)	20.8 (10)	15.4 (2)	22.9 (8)	.271 ⁺
Admission after aggressive incident, % (n)	25.0 (12)	46.2 (6)	17.1 (6)	.010 ⁺
Patients with aggressive incidents in history, % (n)	31.3 (15)	23.1 (3)	34.3 (12)	.397 ⁺
GAF score at admission (GAF), md (IQR)	35.0 (10.0)	40.0 (5.0)	35.0 (10.0)	.004 ⁺⁺
First admission at psychiatric hospital, % (n)	20.8 (10)	46.2 (6)	11.4 (4)	.002 ⁺

+ = Pearson's Chi-square test; ++ = Mann-Whitney U-test

Table 6.3: Results of univariate regression analysis

	β	SE	Wald (df = 1)	p	Odds ratio (95% CI)
Age of nursing staff	-0.014	0.030	0.200	.655	0.99 (0.93 – 1.05)
Physical stature	-1.561	0.627	6.187	.010	0.21 (0.06 – 0.72)
BMI	0.091	0.158	0.330	.565	1.10 (0.80 – 1.49)
Proportion of female nurses	1.663	0.861	3.731	.053	5.27 (0.98 – 28.49)
Educational level	0.008	0.446	<0.001	.986	1.01 (0.42 – 2.41)
Experience in mental health of nursing staff	-0.023	0.038	0.373	.541	0.98 (0.91 – 1.05)
Length of employment of nursing staff	-0.112	0.094	1.417	.234	0.89 (0.74 – 1.08)
Level of employment (full time versus part-time)	-0.142	0.242	0.344	.558	0.87 (0.54 – 1.39)

To adjust for potential confounding due to these imbalances, we corrected the association of the possible predictors and seclusion with the propensity score (an aggregated variable of patients' characteristics). Secluded patients (median = .01310; IQR = .0157) and non-secluded patients (median = .00079; IQR = .0059) differed significantly in their propensity scores ($U = 61.07$; $p < .001$).

Main results

A higher (although not significant) proportion of female nurses present at the ward increased the odds of a patient being secluded, OR = 5.27 (0.98 – 28.49).

Furthermore, a larger mean physical stature of the shifts' nursing team reduced the odds of seclusion, OR = 0.21 (0.06 – 0.72). This suggests that presence of female nurses was associated with higher chance of seclusion of patients, while presence of nurses with large physical stature was associated with significantly lower chance of seclusion during their shift. These were also the only variables with a univariate p value $\leq .20$ as predictor for seclusion (**Table 6.3**).

Male and female nurses differed significantly in age ($U = 351.00$; $p = .008$), i.e. male nurses were significantly older than female nurses were. To assess whether this confounded the relation between the proportion of female nurses and seclusion we added the mean age of

the nursing staff present in the shift to the regression model with proportion of female nurses and the propensity score as independent variables and found a small increase of the odds ratio for female nurses, $OR_{adjusted} = 5.48 (0.95 - 29.62)$. We concluded that age did not confound this relation according to the rule of thumb that a factor is a confounder when the adjusted effect estimate differs at least 10% from the unadjusted effect (29)).

Male and female nurses also differed significantly in physical stature ($U = 282.50$; $p = .026$). Male nurses had significantly larger physical statures than female nurses. To assess whether this difference in physical stature biased the relation between the proportion of female nurses and seclusion we added the mean physical stature of the shifts' nursing team to the regression model with proportion of female nurses and the propensity score as independent variables. The decrease of the odds ratio for the proportion of female nurses, $OR_{adjusted} = 2.71 (0.44 - 16.71)$, suggested that the mean physical stature did confound the relation between proportion female nurses and seclusion as this differed more than 10% from the unadjusted effect estimates. In the model with the proportion of female nurses and the propensity score as independent variables, we found a large (although at a trend level) effect for the mean physical stature of the shifts' nursing team, $OR_{adjusted} = 0.27 (0.07 - 1.04)$.

Discussion

Key results

We found a substantial (although at a trend level) association between seclusion and gender and a substantial and significant association between physical stature and seclusion. Physical stature, controlled for gender, may be an important characteristic of nurses predicting seclusion. The effect of nurses' gender is in line with the findings of Vollema, Hollants (19) but not in accordance to the findings of Janssen, Noorthoorn (20) and Bowers, Allan (30). We found no significant association between nurses' age and seclusion (in line with Nijman, Duangto (18)) and for the nurses' experience in mental health care, contrary to Janssen, Noorthoorn (20). We did not find previous studies on the effect of nurses' physical stature on seclusion. Because of the lack of previous evidence on this matter, we consider this the most important new finding of this study.

We found no significant effect of patient-staff ratio on seclusion though we hypothesised that patient-staff ratio would be significantly related to seclusion risk, in accordance to Tunde-Ayinmode and Little (17) and Morrison and Lehane (22). However, the fact that we found no effect on patient-staff ratio may be due to the lack of variance in patient-staff ratio in our sample, or due to the small sample size.

A previous study showed that feelings of unsafety among nurses on the ward measured retrospectively were related to seclusion (19). However, to measure this prospectively may make nurses more aware of their feelings of feeling unsafety, which may influence the probability of seclusion. Obviously, the occurrence of an aggressive incident influences feelings of unsafety of nurses. By introducing feelings of safety as a possible risk factor for the occurrence of seclusion, we may also influence feelings of unsafety and could therefore bias the association. For this reason, we did not include this factor in our prospective study. Nevertheless, hazardous behaviour is the primary criterion for seclusion. This will affect the feelings of safety of the nurse and we do recognize its importance on the use seclusion and other coercive measures.

Strengths & limitations

Previous studies on this matter collected data retrospectively (18-20) used a cross-sectional design (21) or primarily addressed patient-staff ratios (17, 22). One of the strengths of our study is that we used a rigorous, census-based, prospective design to collect data. Moreover, data collection took place on a highly detailed level; we collected data on a level of shift, so we could confirm that the analysed nurses were present at the time the event took place. We also analysed all patient charts for events, instead of only analysing the events reported by nurses.

However, the findings of our study should be interpreted in the light of the following limitations. The first and main limitation is that we performed this study with a relatively small sample size, so the statistical power is limited. Therefore, despite the fact that we found large effects, replication is needed. The second major limitation is that we performed this study in a single hospital, restricting the generalisability of our results, although stature and gender may not be very context sensitive. Finally, logistic regression analysis assumes that the nurses within the team were independent data sources, which was probably not the

case. Nurses within a team will influence each other when working together in a shift. In future studies with enough statistical power multilevel logistic regression analyses must be considered.

Generalisability

Our study was performed at a closed admission ward in an academic hospital. Because this admission ward has an obligation to accept involuntary admissions from Amsterdam and surroundings, we propose that our findings are generalisable to closed admission wards of non-academic clinics as well. Legislations of psychiatric admissions in the Netherlands are identical for academic and non-academic hospitals.

Interpretation

We found substantial effect sizes for proportion of female nurses (OR = 5.27) and large mean physical stature of the shifts' nursing team (OR = 0.21) on seclusion. Physical stature seems to be a more robust factor in the multiple regression model suggesting that the main part of the association between the proportion of female nurses and seclusion is mediated by physical stature. Because of the small sample size, we are cautious with the interpretation of these findings. Therefore, in future research the influence of stature and factors associated with stature as well as unit characteristics like patient staff ratio should be evaluated in studies with a larger sample size.

Creating a safe environment in psychiatric admission wards is an important challenge of professionals worldwide. Several initiatives for reducing coercion and for improving quality of care have started in the recent years, such as the High Intensive Care-model in the Netherlands (31) and Safewards internationally (32, 33). Both initiatives emphasize the importance of the interaction between nurses and patients.

If our result that the sex and stature of nurses is related to seclusion is replicated in a larger study, this may have practical implications. We propose that raising awareness of the influence of nurses on (the reduction of) coercive measures needs further exploration. Aggression and violence both have a possible interactional component and research and innovation should not focus on patients alone. The composition of nursing teams can be influenced by policy makers and may be a factor of interest when taking the next step in

further reducing coercive measures in mental health care. When our main results are replicated in an independent study, we should consider adaptations in nursing team composition. This may contribute to the goal of diminishing seclusion as a coercive measure in mental health care as much as possible. Seclusion and other coercive measures in mental health care are a threat to patients' safety and should be used with great caution. According to article 5, section 1, in the European Convention for the Protection of Human Rights and Fundamental Freedoms declares that no person should be deprived of its liberty. As section 1e states, in case of severe psychiatric disorders, lawful seclusion is sometimes necessary. It does not alter the fact that national and international standards in using coercion in mental health care should be focussed on preventing coercion by all means possible. By gaining more knowledge concerning risk factors for coercion and seclusion, we aim to contribute to the international goal of banning seclusion from mental health facilities.

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CHAPTER 7

Influence of nursing staff characteristics on seclusion in acute mental health care - a prospective two-year follow-up study

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Abstract

INTRODUCTION Seclusion still occurs on mental health wards, despite absence of therapeutic efficacy and high risks of adverse patient effects. Literature on the effect of nursing teams, and the role of psychological characteristics in particular, on frequency of seclusion is scarce.

AIM To explore the influence of demographic, professional or psychological, nursing team-level, and shift characteristics on the frequency of use of seclusion.

METHODS Prospective two-year follow-up study.

RESULTS We found that the probability of seclusion was lower when nursing teams with at least 75% males were on duty, compared to female only teams, odds ratio (OR = .283; 95% CrI .046 – .811). We observed a trend indicating that teams scoring higher on the openness personality dimension secluded less, OR = .636; 95% CrI .292 – 1.156).

DISCUSSION Higher proportions of male nurses in teams on duty were associated with lower likelihood of seclusion. We found an indication that teams with a higher mean openness personality trait tended to seclude less. These findings, if causal, could serve as an incentive to reflect on staff mix if circumstances demand better prevention of seclusion.

Introduction

Coercive measures, such as seclusion and restraint, are still common practice on mental health wards in some countries, despite the absence of evidence for their therapeutic efficacy (1, 2). Coercive measures, while solving an acute problem with safety hazards in the short term, imply a violation of patients' autonomy, damage the therapeutic relationship and will often reduce the possibilities of future shared decision-making (3, 4). Furthermore, coercive measures can have other negative consequences, such as posttraumatic stress, physical injury and even death (1, 5, 6). Therefore, the application of coercive measures in mental health care has been under fierce debate over the last few decades (7, 8). Clinicians often perceive coercive measures as necessary when dealing with situations deemed dangerous, although they acknowledge the well-known negative consequences (9-13). The type of coercive measure used on mental health wards (e.g. seclusion, physical restraint, involuntary medication) and frequency of use vary substantially between countries (14, 15). The Netherlands is one of the countries that use seclusion as intervention of last resort (14, 16). Seclusion is the containment of patients in a room with minimal resources and designed to prevent physical injury (17). The use of seclusion in the Netherlands declined from 11.8% in 2008 to 7.1% of patients admitted in 2013, likely because of a nation-wide seclusion reduction program (18). The probability of seclusion seems higher in male patients, patients of younger age and involuntarily admitted patients (10, 19-27).

Compared to research on patient characteristics, research on the influence of nursing staff characteristics is relatively scarce. Nurses seem to influence the decision to seclude patients (8). Studies on demographic characteristics of nurses, such as gender and age, or professional characteristics, such as education and work experience, show inconclusive results (9, 26, 28-32). Even sparser is research on the possible influence of nurses' psychological characteristics. Pawlowski and Baranowski (33) reported that nurses' 'creative' personality, assessed with Gough's Adjective Check List (34) was associated with less use of seclusion. Yang, Hargreaves (35) found that nurses with a high score on an empathy scale secluded less than those with low scores did. Vollema, Hollants (31) found that nurses' feeling of safety decreased the likelihood of seclusion. As far as we are aware, there have been no studies on the association between seclusion and nurses' personality traits assessed with a common model of personality, such as the Five Factor Model (36). Finally, shift

characteristics, such as patient-staff ratio and shift, had extensive attention in scientific literature, but showed equivocal results (28, 30, 35, 37-40).

In sum, there is a lack of evidence concerning the influence of nursing team characteristics (demographic, professional or psychological) and shift characteristics on the use of seclusion in acute mental health care.

The aim of our study was to explore the influence of nursing team characteristics (demographic, professional or psychological) and shift characteristics on the occurrence of seclusion on an acute mental health ward, while controlling for patient characteristics.

Materials and methods

Design

We conducted a prospective two-year follow-up study on a closed mental health admission ward for adult patients in a university hospital in Amsterdam.

Participants

All patients who resided and nurses who worked on the study ward between 1 January 2013 and 31 December 2014 were included in the study, which overlapped with our pilot study (32). The study ward has twelve beds and is equipped with two seclusion rooms. The ward admits both men and women. Most patients had a civil involuntary admission order according to the Dutch Mental Health Act. The nurses of the ward knew that the study focused on factors influencing the use of seclusion, but were unaware of the study variables to diminish the risk of performance bias. Staff members were mostly registered nurses with bachelors (European Qualifications Framework [EQF] 6) or vocational (EQF 4) degrees and scheduled in a ratio of one registered nurse to every three patients during day (7:30 AM – 4:00 PM) and evening shifts (2:30 PM – 11:00 PM) and one registered nurse to six patients during night shifts (22:45 PM – 7.45 AM).

Data collection

Nurses provided demographic and professional characteristics on their entry into the study. To assess psychological characteristics, nurses were asked to fill out the Neuroticism

Extraversion Openness Five-Factor Inventory 3 (NEO-FFI-3) (41). Nurses participated voluntarily and we coded their data before analyses to ensure their privacy. Furthermore, we gathered data on shift characteristics, such as type of shift and patient-staff ratio. We gathered shift data three times per day (day, evening and night shift) and used nursing reports to capture all aggressive incidents and coercive measures. Data collection was identical for all patients and consisted of demographic and clinical characteristics.

Nursing team characteristics

We gathered characteristics of individual nurses at their entry into the study. We assessed 1) demographic characteristics: gender (male/female); age (years); BMI; physical stature; 2) professional characteristics: registered nurse (y/n); educational level (bachelor vs non-bachelor); level of employment (>32- 40 hours per week vs <32 hours per week); cumulative employment as a nurse (years) ; cumulative experience in mental health care (years); and 3) online questionnaire using LimeSurvey® to assess psychological characteristics and general feeling of safety at work. We used mean scores of the individual nurses present in a shift team to assess team characteristics in the statistical model.

Three independent assessors scored the subjective variable *physical stature* on a five-point scale (very small, small, average, large and very large); the mean score was used in the analysis. The interrater reliability of this estimate was moderate, Fleiss $\kappa = .43$ (42, 43).

Concerning psychological characteristics, we assessed Five Factor Model personality traits online with the NEO-FFI-3 (41), a self-report questionnaire consisting of sixty items scored on five-point Likert-scales. Items result in five basic personality dimension scores, namely: neuroticism, extraversion, openness, agreeableness and conscientiousness. The NEO-FFI-3 has been designed for clinical and non-clinical personality testing and has adequate to good psychometric properties (41). Our study considered general feeling of safety as a trait of an individual nurse. After an extensive literature search, we found no instrument to measure the general feeling of safety of nurses. Nurses scored four items about their general feeling of safety in their organisation, their ward, with their colleagues and with their manager on five-point Likert scales (strongly disagree, disagree, neutral, agree, strongly agree), which were combined into a total score.

Shift characteristics

Assessment of shift characteristics (date, shift (day, evening, night), number of nurses; number of registered nurses; number of student nurses; number of patients) and outcome measurements (seclusion) were performed three times each day (day, evening or night shift). The outcome (seclusion) was explicit, dichotomous and registered according to the Argus-system, a national coercive measurement registry (44).

Patient characteristics

Data on patient characteristics were gathered from the electronic health record and consisted of gender (male/female), age (years), length of admission (days), involuntary nature of the admission (y/n), diagnosis according to the Diagnostic Statistical Manual IV-TR (psychotic disorder, bipolar disorder or other disorder) (DSM-IV-TR) (45), secondary diagnosis of substance abuse, personality disorder and/or intellectual impairment, prior seclusion (y/n), whether the admission was preceded by an aggressive event (y/n), whether it was their first admission in mental health care (y/n); Global Assessment of Functioning [GAF] score; Health of Nation Outcome Score [HoNOS]). Higher score on GAF indicates better functioning (46) and lower score on HoNOS indicates better functioning or less severe symptoms (47).

Ethical considerations

The patient population of a closed admission ward is vulnerable and careful attention for their ability to give informed consent is required (48-50). The Medical Ethics Review Committee of our institution reviewed our study protocol. The Dutch Medical Research Involving Human Subject Act (WMO) is based on international quality standards for medical research, the Declaration of Helsinki and Good Clinical Practice in particular. This act considers formal approval by a medical ethics review committee mandatory if it concerns medical research and involves participants who are subjected to procedures or are required to follow rules of behavior (51). The committee opined that our study solely observed routine clinical practice and neither applied interventions nor subjected patients to additional behavioral rules. Thereby, our study was deemed to have no impact on the treatment, cause no risk concerning damage or nuisance nor was it deemed to negatively

affect patients' wellbeing. Thereby, the committee decided that formal ethics approval was not needed according to Dutch law.

To protect patients' privacy, clinical staff members collected data from the electronic patient record and recoded and anonymised the data before analysis. Because of the importance of improving the knowledge on factors influencing the use of seclusion and absence of impact on patients' privacy or wellbeing due to the anonymisation of data, we were allowed not to seek active consent to re-use patients' data for this study, according to the exception grounds of article 24 of the Dutch GDPR Implementation Act (52). Patients had the right to object to the re-use of their treatment data for scientific research and the pertinent procedure was explained on our institution's website. None of the patients objected to use of anonymised treatment data.

Staff members were asked to participate on a voluntary basis and give permission to the use of their data in the analysis. Staff members were free to refuse participation and the researchers did not communicate the (non)participation of a staff member to other staff members or management. We used data recorded by staff members for treatment purposes, such as the daily shift reports by nurses. The researchers had no hierarchical relationship with the staff members.

Analysis

We used STATA SE, version 15 and MLwiN, version 3.02 to analyse the data. We used frequencies to report nominal and ordinal variables and means and standard deviations to report continuous variables. We used a median and interquartile range (IQR) for the reporting of highly skewed variables. We used a logistic cross-classified random-effects model to estimate the associations of various independent variables with seclusion. We report odds ratios and their corresponding 95% credible intervals (95% CrI).

Table 7.1: Baseline characteristics at index admission of patients (n = 224)

Characteristic	Secluded group (n = 46)	Non-secluded group (n = 178)	Group difference (p-value)
Male, n (%)	25 (54.3)	108 (60.7)	.501 ^a
Age (years), mean (SD)	37.1 (13.4)	39.3 (13.6)	.316 ^b
Length of admission (days), median (IQR)	25 (12-38)	12 (3-21)	<.001 ^c
Involuntary admission, n (%)	36 (78.3)	114 (64.0)	.079 ^a
Primary diagnosis, n (%)			.655 ^d
Psychotic disorder	32 (69.6)	119 (66.9)	
Bipolar disorder	7 (15.2)	22 (12.4)	
Other disorder	7 (15.2)	37 (20.8)	
Secondary diagnosis, n (%)			
Substance abuse	20 (43.5)	72 (40.4)	.739 ^a
Intellectual impairment	3 (6.5)	12 (6.7)	1.000 ^a
Personality disorder	6 (13.0)	19 (10.7)	.607 ^a
Aggressive incident reason for admission, n (%)	18 (39.1)	52 (29.2)	.214 ^a
Seclusion in patient's history, n (%)	15 (32.6)	31 (17.4)	.039 ^a
First admission in mental health care, n (%)	12 (26.1)	51 (28.7)	.855 ^a

^a Fisher's Exact test, two-sided; ^b Student's t-test, independent samples; ^c Mann-Whitney U test, independent samples; ^d Chi square test, two-sided (df = 2); SD = Standard deviation; IQR = Interquartile range

Cross-classification signifies that our data do not have a simple hierarchical structure in which each nursing shift team consists of unique individual nurses and each patient receives care from a single nurse during the entire admission. In clinical reality, the 98 different nurses, over the 2 years of follow-up, formed 1299 different team compositions during 2190 shifts (3 shifts during 730 days). Most patients encountered many teams and many different nurses over their admission(s). Statistically, the variances in cross-classified data are not identical to strictly hierarchical data, the data is nested in two different clustered on the same level.

We used the cross-classified option in STATA's `runmlwin` command (53, 54). We describe the exact regression commands in **Online Supplement 7.1**. Briefly, we obtained the starting values for the Markov Chain Monte Carlo analyses using penalized quasi-likelihood estimates (PQL2) as explained in the user manual to `runmlwin`. The burn-in value was 2000 (the first 2000 MCMC chains were not used for estimation) and the number of chains run was 20,000.

We started with a basic model with patient characteristics and, subsequently, extended the model a set of with nursing team and shift characteristics. The variables describing the nursing team characteristics were constructed as the means of the individual nurses' values. For example, team age reflects the mean age of the nurses in the shift and team gender reflects the proportion of male nurses in the shift team. To improve the stability of the model, we divided these numerical variables into three (cut-offs the 17th and 83rd centile values) or four (cut-offs the 25th, 50th and 75th centile values) categories in order to retain good contrast between the lowest and highest categories. We included variables in the model based on earlier research or variables of our interest. We removed variables if their p-value was above .20 (55).

Results

Descriptive data

Table 7.1 contains a summary of the patients' baseline characteristics. We included 224 unique patients in 310 admissions, of whom 133 were male (59.4%) and with an age at index admission ranging from 18 to 80 years. Due to the complexity of the statistical model, we decided not to model the fact that some patients ($n = 57$) were admitted more than once.

The number of patients that were present at the ward in a single shift ranged from five to 13. The majority of the admitted patients suffered from psychotic disorders (67.4%) and substance abuse as a secondary diagnosis was common (41.1%). The majority of the patients (67%) was involuntarily admitted under the Dutch Mental Health Act to avoid harm to themselves, others or objects. During the study period, we observed 112 seclusions in 46 patients. Twenty-eight patients were secluded once; 18 patients were secluded twice or more. The number of seclusions per patient ranged from one to 17. On average, patients secluded during follow up had undergone more prior seclusions and longer admissions than patients from the non-secluded group had.

Table 7.2: Baseline characteristics of nursing staff (n = 98)

Characteristic		Missing data, n
Male, n	38	0
Age (years), mean (SD)	36.3 (13.5)	6
BMI, mean (SD)	23.4 (3.0)	7
Stature, n		19
Very small	2	
Small	14	
Average	44	
Large	18	
Very large	1	
Registered nurse, n	76	0
Bachelor of nursing, n	52	3
Years of employment, median (IQR)	2.0 (0-5.3)	3
Years of experience in psychiatry, median (IQR)	4.0 (0-17)	4
Permanent staff, n	26	0
Full time staff, n	59	0

SD = Standard deviation; BMI = Body Mass Index; IQR = Interquartile range

Stature is a subjective variable, scored independently by three raters on a five-point scale (very small, smaller than average, average, larger than average and very large). The interrater reliability of this estimate was moderate, Fleiss $\kappa = .43$. Note, since 98 is close to 100, numbers are almost equal to percentages and the latter are not reported.

Table 7.2 contains a summary of the nursing staff baseline characteristics and the amount of missing data per variable. The nursing staff consisted of 98 nurses during the study period. Thirty-eight nurses were male (38.8%) and their age ranged from 18 to 61 years. The number of registered nurses per shift ranged from two to seven. The ward had high numbers of temporary staff (56.1%) and (supernumerary) student nurses (17.4%). However, registered nurses that were part of the permanent nursing team of the ward worked 81.6% of the shifts worked during the study period.

Table 7.3 contains a summary of the results of the personality tests and the items on general feeling of safety. The NEO-FFI-3 personality traits neuroticism, extraversion and conscientiousness and the general feeling of safety had acceptable internal consistency, openness and agreeableness had lower internal consistency. Internal consistencies were congruent with several samples within the Dutch population (56). Included nurses differed slightly from the reference categories in the general Dutch population (56).

Table 7.3: Psychological characteristics of nursing staff at baseline

	Sample, mean (SD)	Cronbach's α	Reference group, mean (SD)
NEO-FFI-3			
Neuroticism	29.5 (6.1)	.782	34.0 (7.5)
Extraversion	43.3 (6.1)	.812	39.3 (5.8)
Openness	42.5 (5.2)	.688	38.9 (5.7)
Agreeableness	45.2 (4.6)	.617	41.1 (5.6)
Conscientiousness	44.7 (5.3)	.765	43.4 (5.7)
General feeling of safety	15.4 (2.4)	.899	

NEO-FFI-3 = Neuroticism Extraversion Openness Five Factor Inventory 3d version; SD = Standard deviation

Reference group based on a representative sample (n = 1715) from the Dutch population (56). Cronbach's α is a measure for internal consistency. Sample size n = 62

Visual inspection suggested that average team scores of our participants are higher on extraversion and openness and lower on neuroticism. Thirty-six nurses refused participation or did not respond to the request of the researchers to participate with the psychological

questionnaire. These nurses were responsible for 19.1% of the shifts worked during the study period.

Main results

We present the results from our final model in **Table 7.4**. We removed nurses' age before the final analysis, because of collinearity with nurses' experience in mental health care. We excluded GAF and HoNOS data from our final model due to poor quality of the data (high proportion of missing data and the available data was considered inconsistent with the patients' condition). We removed ethnicity, Dutch citizenship, seclusion in patient history, admission after aggression, first admission in mental health care, admission during weekends (patient characteristics), BMI, work experience, educational level, years of employment at the current hospital, fulltime nurse (nursing team characteristics) and patient-staff ratio (shift characteristics) from the analysis, because the p-values for their odds ratios were larger than 0.20.

Nursing team characteristics

We found that teams with more male nurses (50 – 75% males and >75% males) were associated with less seclusion than teams with only female nurses, respectively OR (95%CrI) = .616 (.319 – 1.062) and OR (95%CrI) = .283 (.046 – .811). The overall difference between the three categories and the reference group was statistically significant ($p = .021$). Other personal and professional characteristics also showed small associations with seclusion but the precision with which we could measure these was more limited and therefore these estimates were also compatible with the absence of an effect. We analysed team means of the Five Factor Model personality traits and general feeling of safety in our final model. When looking at the magnitude and direction of the odds ratios, we viewed a possible association of lower mean scores of openness and seclusion, OR (95%CrI) = .697 (.404 – 1.113), $p = .091$ for overall difference with reference group).

Shift characteristics

Each shift had a team consisting of two to seven nurses. Night shifts had usually two nurses. Night shifts were associated with less seclusion than day shifts, OR (95%CrI) = .411 (.175 – .837).

Table 7.4: Results of cross-classified multilevel regression model predicting the occurrence of seclusion

	Odds ratio	95% CrI	P	Standard error
Nursing team characteristics				
Gender			0.021	
Only female nurses	reference			
Mixed team, majority females	.801	.468 - 1.290	0.338	.211
Mixed team, 50 - 75% males	.616	.319 - 1.062	0.078	.192
>75% male nurses	.283	.046 - .811	0.014	.201
Stature (quartiles)			0.615	
1	reference			
2	.607	.277 - 1.189	0.120	.235
3	.940	.500 - 1.619	0.698	.297
4	1.351	.699 - 2.388	0.418	.443
Team with only registered nurses	.906	.487 - 1.151	0.628	.266
Nursing team psychological characteristics				
Neuroticism [†]			0.220	
1	reference			
2	1.914	.987 - 3.444	0.064	.654
3	1.414	.556 - 2.961	0.514	.634
Extraversion [†]			0.517	
1	reference			
2	1.084	.590 - 1.840	0.916	.322
3	1.588	.630 - 3.228	0.358	.677
Openness [†]			0.091	
1	reference			
2	.697	.404 - 1.113	0.134	.186
3	.636	.292 - 1.156	0.144	.224

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Table 7.4 Continued

Conscientiousness [†]			.451	
1	reference			
2	1.197	.677 - 2.007	0.642	.356
3	1.501	.686 - 2.989	0.368	.586
Agreeableness [†]			0.551	
1	reference			
2	1.110	.660 - 1.806	0.792	.299
3	1.403	.636 - 2.659	0.422	.516
General feeling of safety [†]			0.331	
1	reference			
2	.890	.519 - 1.471	0.556	.248
3	.717	.346 - 1.350	0.284	.262
Shift characteristics				
Day shift	reference			
Evening shift	1.263	.751 - 2.027	0.430	.333
Night shift	.411	.175 - .837	<0.001	.166
Patient characteristics				
Male	.801	.515 - 1.213	0.266	.177
Age [¶]	.803	.733 - .880	<0.001	.037
Primary diagnosis				
Psychotic disorder	reference			
Bipolar disorder	2.235	1.289 - 3.554	0.008	.586
Other diagnosis	4.655	2.490 - 7.664	<0.001	1.362
Comorbidity				
Substance abuse	.426	.260 - .647	<0.001	.100
Personality disorder	3.320	1.913 - 5.031	<0.001	.824
Intellectual impairment	2.327	1.110 - 4.221	0.016	.729
Involuntary admission	3.021	1.541 - 5.571	<0.001	1.081

CrI = Credible interval; SD = Standard deviation; [†] Cut-offs at centile 17 and 83; [¶] Effect size of patient's age is reported in age differences (steps) of 5 years.

To obtain good contrasts in the explanatory variables, we avoided using dichotomies, and used at least three categories for each

variable. The nurses' gender is analysed in four categories, namely teams with only female nurses, mixed teams with more female nurses, mixed teams with 50 to 75% male nurses and teams with more than 75% male nurses. Teams with only female nurses are the reference category. The variable nurses' stature is analysed in four about equally sized groups (quartiles) of the mean team stature, using the quartile with the lowest mean stature as reference category. The six nursing team personality characteristics are divided into three categories with cut-offs at the 17th and 83 centiles of the distribution (1/6th, 2/3rd, and 1/6th) using the lowest categories as the reference categories. The code of the logistic cross-classified multilevel model is explained in **Online supplement 7.1**.

Patient characteristics

Younger patients' age, bipolar disorder, diagnosis other than psychotic disorder, psychiatric comorbidity (personality disorder and intellectual impairment) and involuntary admission were associated with higher probability of seclusion. Comorbid substance abuse was associated with less seclusion.

Discussion

This study aimed to explore the effects of nursing team characteristics (demographic, professional or psychological), shift characteristics on the use of seclusion on acute mental health wards, while controlling for patient characteristics. We found that having more male nurses in a team was associated with fewer seclusions. In addition, higher team score on the personality trait 'openness' tended to be associated with fewer seclusions.

There is previous evidence concurring with our finding that more male nurses in teams is associated with less seclusion (30), although other authors reported no association or an inverse association (9, 28, 29, 31, 37, 39). However, we observe some overlap in the confidence intervals of studies that report associations between male nurses' proportional representation and seclusion. Apart from gender, we found no demographic or professional nurse-related variables associated with seclusion. Other authors also investigated demographic and professional characteristics, such as age (28, 57), educational level (9, 26, 58) and working experience (28, 30, 40, 58). Despite of some overlap in the confidence intervals, the majority of these results in these studies varied substantially, on both precision and direction of the effect.

Concerning psychological factors, we found some evidence of less seclusion with teams scoring higher on the personality trait of openness. Earlier studies on nurses' personality in relation to seclusion used measurement scales other than the Big Five personality traits,

which makes the comparison with our finding challenging (33, 35). Since, the openness personality trait is associated with creativity (41) our findings can be seen as in line with the finding of Pawlowski and Baranowski (33) that nurses with creative personalities seem to seclude less. People who score high on openness are generally curious, open to their own emotions and those of others and open to new experiences (41). Absence of an open, supportive patient-staff interaction has been described in the literature as a risk factor for patient-initiated violence in mental healthcare (59). Open and supportive communication between nurses and patients and between nurses themselves is associated with improved patient safety, quality of care and patient satisfaction (60-62). Openness is a helpful characteristic in achieving a ward atmosphere to accomplish high quality of care (63). Subsequently, positive ward atmosphere is associated with less restrictive measures (62). Thereby, an open personality of nurses might contribute to a supportive attitude towards patients and thereby, be helpful in preventing seclusions.

Several patient characteristics were associated with seclusion: young age, bipolar disorder and other diagnosis compared to psychotic disorder, involuntary admission and psychiatric comorbidity. Frequently mentioned (and plausible) patient risk factors for seclusion are young age and male gender, but the existing literature show equivocal results. We observed no significant association between the patient's gender and seclusion, which is in line with several earlier findings (20-24), but in contrast to others (10, 19, 25, 27). Our finding that young age is associated with more seclusion is also in line with earlier studies (10, 19, 21, 24, 25, 27), but contradictory to several others (22, 23, 26). In general, patients with psychotic disorders are most frequently associated with seclusion, which is contrary to our findings (19). However, Cullen, Bowers (10) also report a strong association between bipolar disorder and seclusion. Small sample sizes could explain some of the equivocalness of current literature, but it also may reflect the context-dependent nature of these findings. Involuntary admission is the only factor that is strongly associated with seclusion in almost all studies (10, 19, 21, 24, 25, 27).

As far as we know, the current study is the first to address nursing staff's Big Five personality traits and feelings of safety in a prospective follow-up design with a statistical analysis that takes into account the cross-classified data structure. This study also has several limitations. First, we conducted this study in one acute mental health admission ward in the Netherlands

only, possibly limiting the generalisability to other settings. Since we used a naturalistic follow-up design, we need to be very cautious inferring causality because of residual confounding. We tried to minimise the influence of alternative explanations (confounding) by adding a comprehensive set of covariates, however residual confounding is still possible, for example by interaction between nurses in a shift. Another potential cause of residual confounding was the psychiatric state of the patient. We measured the psychiatric state of the patients with GAF and HoNOS, but the quality of the data was poor due to inadequate use of the scales by clinical staff and many missing data. Because of the poor data quality, we decided not to include these variables in the final analysis. The stature of the nurse was a subjective variable with moderate to low interrater reliability. Due to several seclusion reduction programs, the frequency of seclusion events is low and therefore, the power of this study is limited. The complexity of our statistical model in combination with modest numbers of seclusions precluded us from including interaction terms. The effects we found on nurses' psychological variables were weak to moderate and these findings were not statistically significant at a 5% level and should be interpreted with caution.

Nevertheless, our findings on psychological characteristics serve as an incentive to further explore the subject in research and clinical practice. To our knowledge, no validated scale exists to measure feelings of safety of nursing staff in the context of mental health wards with the risk of violence. Measurement of the feeling of safety of staff often focuses on the perceived interactional safety in teams, such as the concept of psychological safety (64). Future research could explore this concept further and develop measurement scales to measure this construct in a rigorous manner in order to attempt replication of these findings. The final limitation is the analysis of the variables at the team level. Because of this, we can draw conclusions on the influence of team variables (e.g. high proportion of male nurses), but we cannot draw conclusions on the specific influence of individual nurses on the decision to use seclusion.

Conclusion

We conclude that more male nurses on shift seem to lower the probability of the decision to seclude patients and that there is some indication that the extent to which nursing teams have more open personality characteristics may influence the decision whether to seclude

patients. We found no other associations between psychological factors and seclusion. The absence of effect, if true, might be an indication that, to prevent seclusion, psychological characteristics of nurses are no valid selection criteria for nursing teams to prevent seclusion.

Although causality cannot be proven, these findings could serve as an incentive to look beyond patient characteristics and reflect on staff mix if prevention of seclusion is an important aim. Staff members and policy makers on acute psychiatric wards could include information on nurses' personal and psychological traits in decisions around team composition. The care for psychiatric inpatients might benefit from nurses with open personalities. Our findings highlight that nursing team composition might influence the use of seclusion and might serve as an incentive to address the issue of team composition in order to diminish its use. Replication of current findings is needed. In addition, we consider it important to evaluate other factors influencing the psychological wellbeing of nurses, such as traumatic experiences with aggressive behavior, shortage of nursing staff and team culture. Finally, the influence of openness of teams on decision-making concerning the decision to use seclusion is a relevant subject for future research. Thereby, these findings might contribute to the ambition to abolish or severely minimise the use of seclusion in acute mental health care.

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Online supplement 7.1: STATA code for cross-classified multilevel
model

<https://www.psychiatricnursing.org/cms/10.1016/j.apnu.2021.07.003/attachment/5c1c2217-c8ed-4617-85dc-29370061eeee/mmc1.docx>

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CHAPTER 8

Importance of using cross
-classified multilevel models to analyse
the influence of nurses on patient
outcomes –

results of a simulation study

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Submitted

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Abstract

INTRODUCTION Nurses are essential for quality of care in clinical settings. In order to estimate the influence of nurses on patient outcomes properly, researchers must distinguish and account for various forms of nested data. On clinical wards, nurses care for more than one patient at the same time and patients encounter more than one nurse. Therefore, instead of a simple hierarchal structure, nurses and patients are usually in cross-classified structures. Ignoring this may lead to invalid estimates of effect size and variability.

AIM To compare estimates of effect size and variability resulting from standard regression analysis and hierarchical multilevel analysis with cross-classified multilevel analysis under various scenarios.

METHOD We simulated data with cross-classified structures and assessed the effects of ignoring those structures. We used a Markov chain Monte Carlo (MCMC) approach to simulate 18 scenarios, varying sample sizes and cluster sizes, effect sizes and variances. For each scenario, we performed standard linear regression, multilevel regression with random intercepts for patients, multilevel regression with random intercepts for nurses and cross-classified multilevel analysis.

RESULTS Applying cross-classified multilevel model had only small effects on the effect size of the covariates. Ignoring the cross-classified structures led to underestimation of the standard errors of the covariates. This may lead to incorrect statistical inference if one works according to strict thresholds of statistical significance (Type I error). Varying sample size, cluster size, effect size and variance had no meaningful influence on these findings.

CONCLUSION In case of cross-classified data structures, the use of the cross-classified multilevel model can prevent overoptimistic interpretation of the precision of effects, and thereby, draw reliable conclusions on the influence of nurses on patient outcomes.

Introduction

Research on risk factors and predictors of clinical outcomes is essential to enhance quality of care. A skilled and motivated workforce is an important prerequisite for good quality (1). In clinical settings, such as hospitals, nursing homes or mental health facilities, especially nurses determine quality and safety of patient care (2-5). The influence of nurses on quality of care in clinical settings has consequences, for instance, for studies on risk factors. Several studies on patient outcomes, also take staff characteristics into account (6-8). Valid analysis of data from patients and nurses should account for the oftentimes nested data structure. For instance, nested data structures due to participation of multiple centres or multiple wards within a single centre can occur and demand multilevel modelling to account for clustering of observations within centres or wards. However, multilevel modelling may not completely suffice in case of nested observations in more than one cluster when a strictly hierarchical data structure is not at stake. When a strictly hierarchical model is not adequate, cross-classified multilevel models may be needed (9-11).

School and neighbourhood effects are a frequently described example of cross-classification (12, 13). School and neighbourhood effects describe children's data nested in their schools, but also in their neighbourhood. Consider a simple situation with three neighbourhoods (A, B and C) and five schools, where there are observations on children living in one of the neighbourhoods and attending one of the schools (**Figure 8.1**). Each school is located in one neighbourhood (schools 1 and 2 in neighbourhood A, schools 3 and 4 in neighbourhood B and school 5 in neighbourhood C). In **Figure 8.1a**, we demonstrate a situation where students attend school in their own neighbourhood, resulting in a hierarchical three-level structure (student – school – neighbourhood). **Figure 8.1b** shows a situation where a student may attend a school located outside his/her neighbourhood he/she is living. The latter example lacks a strictly hierarchical structure. In this example, schools and neighbourhoods are the so-called crossed factors and is referred to as "school and neighbourhood effects" (12, 13). The cross-classified multilevel model (CCMM), also known as cross-classified random-effects model (CCREM), allows researchers to take into account this particular data structure in one analysis (12).

Figure 8.1a: Example of hierarchical structure of students in schools and neighbourhoods

School	1	2	3	4	5
Neighbourhood					
A	X X X X	X X X X			
B			X X X X	X X X X	
C					X X X X

Figure 8.1b: Example of cross-classified structure of students in schools and neighbourhoods

School	1	2	3	4	5
Neighbourhood					
A	X X X	X X	X	X	X
B	X X		X X X	X X X	
C		X		X	X X

Figure 8.1a is an example of a strictly hierarchical data structure. Each student attends a school situated in the neighbourhood he/she lives in. Schools 1 and 2 are in neighbourhood A, schools 3 and 4 in neighbourhood B and school 5 in neighbourhood C. Figure 8.1b is an example where students do not necessarily attend a school in their neighbourhood. This is an example of a cross-classified data structure. X indicates one student. Note that the extent of cross-classification (deviation from a strict hierarchy) may vary. Here we present just a single scenario.

In health sciences, the need to distinguish clustering of institutions and neighbourhoods may also occur, such as in community mental health care (14, 15) and hospital care (16-18). Application of CCMM in clinical nursing science is slightly different from institution and neighbourhood effects. On clinical wards, several nurses care for a patient during a shift. This implies “nesting of nurses within patients”. On the other hand, nurses care for more than one patient during their shifts, which implies “nesting of patients within nurses” (**Figure 8.2a**). Thereby, patients and nurses are crossed factors in this data structure (**Figure 8.2b**). In analogy with “school and neighbourhood effects”, we refer to this structure as “patient and shift effects”.

Due to this multiple nesting, CCMM is the appropriate model to use when performing research on patient outcomes. However, aside from some studies in neonatal intensive care (19-21), few authors in nursing research use CCMM for their analyses. Unfamiliarity with cross-classification and additional complexity in statistical models might explain this.

Figure 8.2a: Presence of patients and nursing teams

Shift	Team 1	Team 2	Team 3	Team 4	Team 5	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
January 1, day shift	X					X	X			
January 1, evening shift		X				X	X	X		
January 1, night shift			X			X	X	X	X	
January 2, day shift	X					X	X	X	X	
January 2, evening shift				X		X	X	X	X	X
January 2, night shift			X				X	X	X	X
January 3, day shift					X		X	X	X	X
January 3, evening shift				X			X	X	X	X
January 3, night shift			X				X	X		X

Figure 8.2b: Example of patient and shift effects based on Figure 8.2a

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Team 1	X X	X X	X	X	
Team 2	X		X		
Team 3	X	X X X	X X X	X X	X X
Team 4	X	X X	X X	X X	X X
Team 5		X	X	X	X

Figure 8.2 is an example of patient and shift effects, we explore patients and nursing shift teams of a ward in three consecutive days (i.e. nine unique shifts). Patients 1 and 2 were already admitted before the first shift. Patient 1 was discharged during the evening shift of January 2, patient 2 was still admitted during the last shift. Patient 3 was admitted during the evening shift on January 1 and stayed until the last shift. Patient 4 was admitted during night shift on January 1 and discharged in the evening shift of January 3d. Patient 5 was admitted in the evening shift of January 2d and stayed until the last shift. Each nursing shift team has a unique combination of individual nurses. Nursing team 1 worked two consecutive day shifts (January 1 and 2), team 2 only worked during the evening shift of January 2. Team 3 worked the three night shifts. Team 4 worked the last two evening shifts and team 5 worked the day shift on January 3. We see that patients form clusters within nursing shift teams, but nursing shift teams also form clusters within patients. The clustering is not strictly hierarchical. This is a cross-classified data structure.

For school and neighbourhood effects, several (simulation) studies are available to assist researchers in choosing between CCMM and other regression techniques (12, 22-24). However, regarding the influence of using CCMM on patient and shift effects in several circumstances, no information is available as far as we are aware.

Given that, theoretically, CCMM is the correct approach to analyse cross-classified data, it is important to evaluate the effect of using different, more commonly used approaches to data with a cross-classified structure due to patient and shift effects in order to assess the magnitude of errors that may result from using theoretically suboptimal approaches. We, therefore, aim to familiarize clinical researchers with cross-classification and assist them in the decision whether the added complexity of CCMMs is a price worth paying. Building on the guidance for good quality simulation studies (25), we performed a simulation study to compare the different techniques under various scenarios.

Method

Procedures

We performed simulations of two-level cross-classified multilevel models using Markov chain Monte Carlo (MCMC) simulations in STATA, version 14. The full code of our simulations is available upon request. We used a data structure inspired by a real-life observational study in clinical mental health care on the effects of nursing shift team characteristics on the incidence of seclusions and aggressive behaviours of patients.

For each scenario, we generated 1000 samples to compare the statistical methods using a normally distributed continuous outcome variable at patient level. We generated two covariates at the level of the patients, namely, gender (dichotomous, 50% male and 50% female) and age (continuous with $M = 50$ and $SD = 10$). We also created two covariates at the level of nursing shift teams, namely, team composition (46% of the teams were male only versus 54% otherwise) and the mean number of years of work experience in a shift team (continuous with $M = 5$ and $SD = 2$). We created two binary variables indicating daily work shifts (day shift, evening shift and night shift) as dummies for the nominal covariate shift and used day shift as a reference category.

Table 8.1: The components of simulated scenarios

Sample size (2 options)	Cluster size (2 options)	Effect size (2 options)	Variance (3 options)
Larger groups N = 50 patients; N = 100 teams	Larger clusters N = 25 shifts (patients); N = 10-15 shifts (teams)	Stronger effect $\beta = 2$ (gender); $\beta = 1$ (work experience, years); $\beta = 0.2$ (age); β = -1 (shift)	High variance $\sigma^2 = 0.3$
Smaller groups N = 10 patients; N = 20 teams	Smaller clusters N = 5 shifts (patients); N = 2-3 shifts (teams)	Weaker effect $\beta = 0.2$ (gender); $\beta =$ 0.1 (work experience); $\beta = 0.02$ (age); $\beta = -0.1$ (shift)	Intermediate variance $\sigma^2 = 0.2$ Small variance $\sigma^2 = 0.1$

Scenarios

We performed moderately independent simulations on different scenarios that varied in sample sizes, cluster sizes, effect sizes and between group variances (**Table 8.1**). Moderately independent means that we use the same simulated data sets to compare the statistical methods (25). For every scenario (eighteen in total), we performed four different analyses, namely 1) standard linear regression; 2) multilevel regression with a random intercept for patients, ignoring nesting at the nurse level; 3) multilevel regression with a random intercept for nurses, ignoring nesting at the patient level; and 4) CCMM, which takes into account both nursing team and patient as crossed factors.

Our basic scenario consisted of 50 unique patients who stayed on the ward for a duration of 25 shifts (approximately eight days), making up 1250 shifts. 100 unique nursing shift teams covered all 1250 shifts with each team attending 10 to 15 shifts. Every shift has a unique outcome measure; therefore, the number of shifts that a patient stayed at the ward is

equivalent to the amount of observations. In other words, the basic scenario had samples with 50 patients with 25 observations and 100 unique nursing shift teams with 10 to 15 observations. We varied the basic scenario by lowering the number of patients, resulting in samples with 10 patients with 25 observations and 20 nursing shift teams with 10 to 15 observations. We also varied the number of observations (cluster size), with samples consisting of 50 patients with 5 observations and 100 nursing shift teams with 2 to 3 observations.

We varied the effect sizes (regression coefficient β) of the covariates between stronger and weak effects. Stronger effect size meant $\beta = 2$ for the effect of patient gender and $\beta = 1$ for the effect of all male teams and for mean work experience of nursing shift teams, $\beta = 0.2$ for the effect of patient age (effect per year older) and $\beta = -1$ for shift covariates (evening shift and night shift). Weak effect size meant $\beta = 0.2$ for both dichotomous covariates (patients' gender and only male nurses present), $\beta = 0.1$ for mean work experience of nursing shift teams, $\beta = 0.02$ for patients' age and $\beta = -0.1$ for shift covariates (evening shift and night shift). We based the ratio between the magnitudes of β on the findings in a real-life study on which we based our data structure. We analysed all scenarios with large between group variance ($\sigma^2 = 0.3$), intermediate between group variance ($\sigma^2 = 0.2$) and small between group variance ($\sigma^2 = 0.1$).

Table 8.2: Definition of reported criteria

	Definition
B (beta)	Regression coefficient of fixed effects (or: covariates)
SE (standard error)	Standard error of fixed effects (or: covariates)
Bias	Relative deviation of estimate β compared to true β $\left(\frac{\text{True } \beta - \hat{\beta}}{\beta} \right) * 100\%$
Coverage	Proportion of times that the simulated confidence interval contains the true regression coefficient β , coverage should be around 95% (25)

For each scenario, we estimated β and SE of fixed parameters (i.e. covariates on both patient and nurse level) as well as variances at the different levels and reported coverage and bias to

assess model performance (**Table 8.2**). Our main interest was the comparison between multilevel regression and CCMM.

Results

We summarise full results of our simulation in **Online supplement 8.1**. The use of CCMM had minor influence on the effect size estimations (i.e. regression coefficients) of the covariates of all other regression approaches. Changes in sample size, cluster sizes and between-cluster variances had no major influence on the estimated effect sizes.

We observed an effect on the standard errors of the covariates. When applying a multilevel model with a random intercept at the patient level and omitting a random intercept at the nurse level (model 2), the estimations of the standard error of patient level covariates increased, while the estimations of the standard error at the nurse level covariates were stable. Similarly, in model 3 (with a random intercept at the nurse level and omitting a random intercept at the patient level), we observed that the standard error of nurse level covariates increased, while the estimations of the standard error for patient level covariates did not. In the CCMM model, we observed increased standard errors for both patient level covariates and nurse level covariates.

For example, when performing standard linear regression (model 1) in our basic scenario with stronger effect size and large variance, SE was 0.47 for patient's gender and 0.47 the effect of all male teams. Adding a random intercept at the patient level (model 2), SE was 0.99 for patient's gender and 0.48 for all male teams. However, adding a random intercept at the nurse level (model 3) yielded a SE of 0.77 for patient's gender 0.86 for all male teams. Finally, in the CCMM (model 4), SE was 1.09 for patient's gender and 0.82 for all male teams. We summarise the findings on standard error across the different simulations for the basic scenario in **Figure 8.3**.

Besides that, CCMM models had better model performance, looking at bias of the effect size and coverage. We observed more bias in simulations with weak effect sizes compared to those simulating stronger effect sizes. In addition, effect sizes of continuous covariates were more stable than the effect sizes for dichotomous covariates. Furthermore, scenarios with smaller sample sizes showed some under-coverage (<95%). Under CCMM, both clusters of

patient and nursing covariates showed least biased estimations with acceptable coverage (between 93% and 96%).

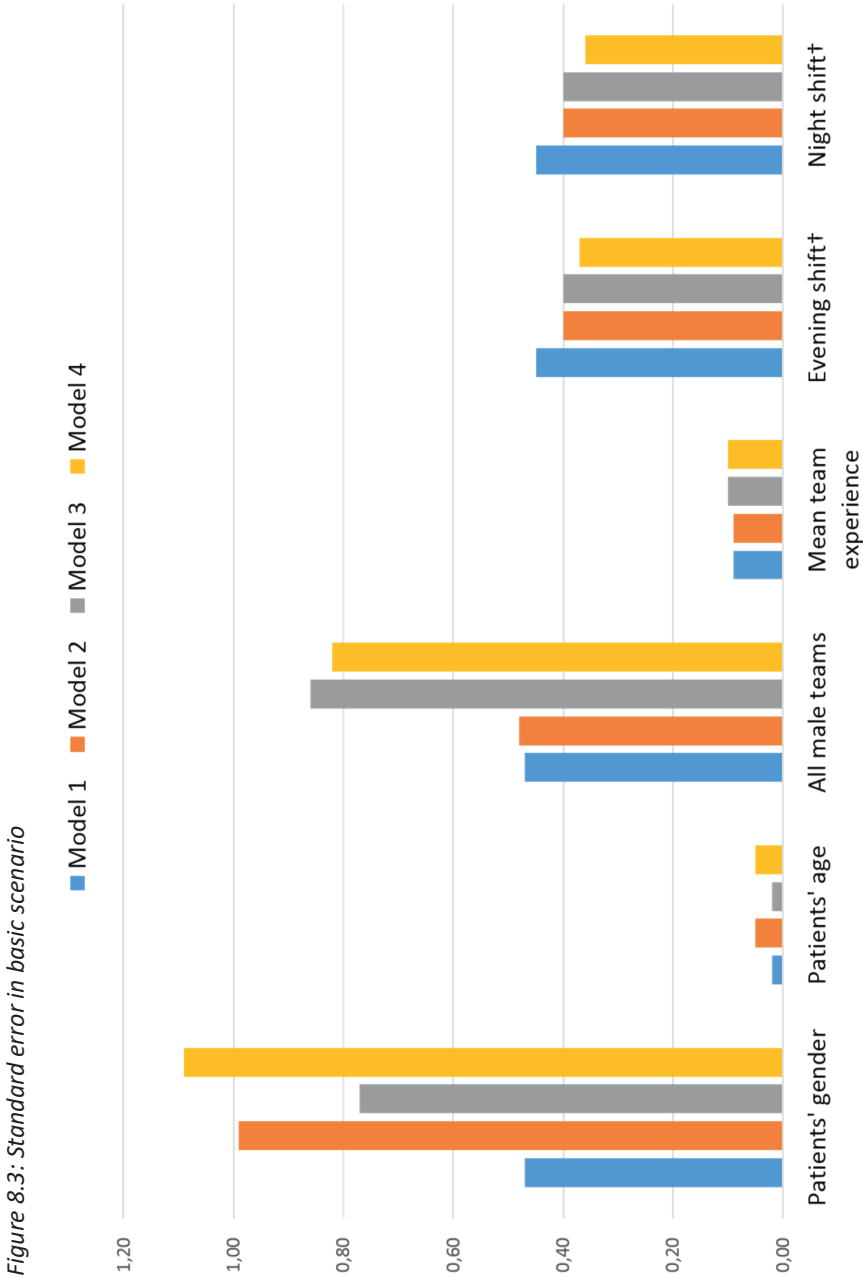


Figure 8.3: Standard error in basic scenario

t = dichotomous dummy variable, compared to day shift

Model 1 = standard linear regression; Model 2 = multilevel regression with a random intercept for patients; Model 3 = multilevel regression with a random intercept for nurses; Model 4 = cross-classified multilevel model

The shift covariates (measured at the lowest level) were remarkably stable in terms of their effect size, and coverage. However, the more variance taken into account, the lower the estimated SEs, with the CCMM models having the smallest SEs for this covariate. For example, in our basic scenario (effect size is strong) with large between-group variance, the effect size was unbiased with a SE of 0.45 in the standard linear model (model 1). The CCMM (model 4) yielded a similar effect size but with a SE of 0.37. The coverage was 94% in both instances. We summarise the results of our basic scenario in **Table 8.3**.

Discussion

We investigated the effect of using different statistical techniques on data with a cross-classified structure, specifically on effect sizes and SEs of the covariates. We found that standard regression analyses caused little bias in the estimates of effect of fixed covariates at the level of patients and nursing shift teams, but underestimated the true SE of these covariates. CCMM resulted in better coverage compared to hierarchical multilevel models for the covariates related to the ignored crossed level. These observations were independent of the order of the CCMM; we simulated both “patient-nursing team” and “nursing team-patient” as CCMM, with identical results.

Patient and shift effects are common when taking into account both patient level and nurse level covariates in a statistical model. It is unlikely that ignoring the cross-classified data structure will lead to opposite conclusions about the direction and magnitude of effect sizes since our study showed that patient and shift effects had no major influence on the estimation of the effect sizes of the covariates. However, we found that ignoring cross-classification could lead to underestimation of standard errors. Underestimation of the standard error may result in incorrect inference based on statistical significance (specifically Type I errors), although we would advise against the rigid use of statistical significance as for example $p < .05$ level (26). In contrast, the standard errors of the indicators for the daily work shifts showed overestimation (i.e. estimation of the standard errors are larger than their true value) when not using CCMM. This is a phenomenon often observed for covariates measured at the lowest level.

Table 8.1: Results of the simulations in the basic scenario

	Model 1: Standard linear model			Model 2: Multilevel model (patients)			Model 3: Multilevel model (nurses)			Model 4: CCMM		
	β (SE)	Bias	Coverage	β (SE)	Bias	Coverage	β (SE)	Bias	Coverage	β (SE)	Bias	Coverage
Patients												
Gender	1.94 (0.47)	-3%	56%	1.97 (0.99)	-2%	88%	1.96 (0.77)	-2%	79%	1.98 (1.09)	-1%	94%
Age	0.20 (0.02)	0%	55%	0.20 (0.05)	0%	94%	0.20 (0.02)	0%	53%	0.20 (0.05)	0%	93%
Nursing team												
Gender	1.97 (0.47)	-2%	63%	2.01 (0.48)	0%	69%	1.97 (0.86)	-2%	92%	2.01 (0.47)	0%	95%
Experience	1.00 (0.09)	0%	76%	1.00 (0.09)	0%	82%	1.00 (0.10)	0%	82%	1.00 (0.10)	0%	94%
Shift †												
Evening shift	-1.0 (0.45)	0%	96%	-1.0 (0.40)	0%	95%	-1.0 (0.40)	0%	94%	-1.0 (0.37)	0%	94%
Night shift	-1.0 (0.45)	0%	93%	-1.0 (0.40)	0%	95%	-1.0 (0.40)	-1%	95%	-1.0 (0.36)	0%	96%
Variance												
Residual	6.46			5.68			5.52			4.99		
Patient				3.08			3.37			2.88		
Nursing team										2.95		

† compared to day shift

Our basic scenario has larger groups and clusters (50 patients with 25 shifts and 100 teams with 10 to 15 shifts), high variance ($\sigma^2 = 0.3$) and stronger effects. True β was 2.0 for patients' age, 2.0 for teams with mostly male nurses, 1.0 for mean nurses' experience in the team, -1.0 for evening shift and -1.0 for night shift. The full overview of our results can be found in **Online supplement 8.1**.

To our knowledge, our study is the first to examine patient and shift effects in a simulation study that compares hierarchical multilevel models with CCMM. Several other authors performed simulations of CCMM in other applications, such as cross-sectional studies (23, 27), longitudinal studies (9, 28) and meta-analyses (29). Our finding that the effect size estimation of the covariates showed little bias is in line with previous simulation studies (23, 27-29). Consequently, if researchers omit correction for cross-classification, the risk of an incorrect conclusion about the magnitude or direction of an effect seems limited. However, the underestimation of standard errors of covariates may well lead to incorrect inferences. Several other authors report similar consequences on standard errors. For instance, Meyers and Beretvas (27) reported that when the model ignores nesting of a factor (e.g. students within schools), standard errors associated with that factor were highly underestimated. Other authors reported comparable findings in studies with both simulated and real-world data (12, 23, 28, 29).

Interpretation of our findings should take into account the following uncertainties. First, we performed simulations with a normally distributed continuous outcome variable. We recognize the importance of dichotomous outcomes for clinical research, but our simulations with a dichotomous outcome variable by using logistic multilevel analysis led to models that did not converge, possibly due to high computational load. This problem often occurs with logistic multilevel analyses (30). Secondly, we assessed several scenarios with different sample sizes and cluster sizes, but we did not evaluate uneven distribution of the size of samples and clusters. In clinical practice, it is plausible that some nursing team compositions are much more prevalent than other teams are. Milliren, Evans (24) investigated this uneven sample size distribution across levels in an example of the school-neighbourhood effect and found no systematic bias because of this phenomenon. Nonetheless, whether this is also the case for clustering of patients and nursing shift teams remains uncertain. Thirdly, the distribution of between-level variance in our CCMM is (roughly) equal between the two crossed levels. In real world data, this is not necessarily the case. Dunn, Richmond (12) used the correct model for cross-classified data in a real-world example with school and neighbourhood effects and compared this to the hierarchal models with one of the contexts (school or neighbourhood) ignored. The between-level variance in both hierarchical models was roughly equal. However, in the CCMM model, schools caused

almost all between-level variance while neighbourhood was no important factor (12). Fourthly, we did not simulate various levels of (partial) cross-classification. In case of full cross-classification, every nursing shift team is cross-classified with every patient. In reality, this is rare. Therefore, we simulated partial cross-classified data. We did not explore the effects of variable degrees of cross-classification, but we suggest this as an interesting subject for future simulation studies. Finally, we simulated a relatively simple model between patients and nursing shift teams. In real clinical research, more complex data structures are common. For instance, in a multicentre study, a partial cross-classified structure could be the care with patients and nursing shift teams as crossed factors, both hierarchically nested within wards or hospitals. Luo and Kwok (28) simulated cross-classified longitudinal data with three levels and found similar results about the fixed effects and their standard errors for the covariates associated with the ignored crossed level. In addition, when modelling individual nurses instead of nursing shift teams only, an even more complex data structure emerges. Besides cross-classification due to patient and shift effects, multiple membership of nursing in nursing shift teams will complicate statistical modelling. Multiple membership is a phenomenon closely related to cross-classification (10). In both cases, multiple nesting of lower-level units in multiple higher-level units occurs. With cross-classified data, there is no hierarchical relation between the higher-level units. Multiple membership means that lower level units are “member” of more than one higher-level unit simultaneously within a hierarchical structure. For example, if several doctors treat hospital patients, these patients are multiple members of doctors. Patients and nursing shift teams are not hierarchically related, but most individual nurses have a hierarchical relationship with nursing shift teams. Because of this, nurses have multiple membership in nursing shift teams (10). The influence of multiple membership of nurses within nursing shift teams is beyond the scope of this paper, but might also be interesting for future simulation studies.

Complex statistical techniques such as CCMM can be a challenge for (clinical) researchers to comprehend and most statistical literature on this matter focusses on a specialised (statistical) audience. With this paper, we hope to provide accessible knowledge for clinical researchers on cross-classified data due to patient and shift effects. Subsequently, more accessible information could improve the decision making process for the use of CCMMs in clinical research. Ultimately, when investigating the influence of nurses on patient

outcomes, the use of CCMM could lead to estimations of the precision of effect sizes that are more accurate. This contributes to the further development of nursing care in clinical settings.

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Online supplement 8.1: Full results of the stimulations

Available upon request.

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CHAPTER 9

General discussion

**UNLOCK
THE
DOORS**

Many patients and staff members associate the seclusion room on psychiatric wards with loneliness, anxiety, anger and other negative emotions. The general aim of this thesis was to add knowledge on seclusion and aggressive behaviour, ultimately in order to use this knowledge in prevention strategies that improve patient care in mental health services.

Main findings

The first part of this thesis assesses the risk of aggression and adverse events on acute psychiatric wards (**part I**). We performed a grounded theory study to assess the perspectives of patients and nurses on the cause of aggressive incidents and their suggestions towards prevention of aggressive behaviour (**chapter 2**). Firstly, we analysed the underlying theory of different perspectives of patients and nurses towards aggressive behaviour. Secondly, we asked patients and nurses for recommendations to prevent aggression in the future. We found that with the majority of incidents, patients and nurses described similar facts of the aggressive events. However, the interpretation of the severity of the aggressive behaviour showed differences. Because severity of aggressive behaviour is no objective construct, we introduced the concept *perceived severity*. Perceived severity is the subjective severity of aggressive behaviour perceived by the aggressor, victim or witness. Regarding the recommendations of patients and nurses for prevention, we found that patients generally give recommendations for their own case, a concept that we named personalised de-escalation techniques. Nurses mentioned recommendations on more general level, such as earlier admission of less restrictive interventions or changes in the treatment facilities of the ward. Most patients were, despite of their psychiatric condition, already soon after the incident, capable to give valuable information to prevent aggressive behaviour of themselves in the future.

In **chapter 3**, we report the results of a multivariable analysis of a database of adverse events and medical errors of the Pennsylvania Health Care Cost Containment Council. We analysed the database for associations between patient characteristics and the incidence of adverse events (model 1) and medical errors (model 2). One of the adverse events analysed was aggressive behaviour of patients. We found that longer length of stay, older patients' age, admission during weekends and Medicare/Medicaid health insurance (compared to

commercial insurance) were associated with higher risk of adverse events and medical errors.

In **chapter 4**, we investigated the influence of patient, nursing team and shift characteristics concerning the incidence of aggressive behaviour. Nursing team characteristics consisted of demographic, professional and psychological characteristics (personality trait measured by the Five-Factor Model [1] and feeling of safety). Subsequently, we analysed the difference between verbal and physical aggressive behaviour in relation to patient, nursing team and shift characteristics. We found associations between less aggressive behaviour and nursing shift team with more male nurses, OR (95% CrI) = .56 (.34 – .82), and lower scores on extraversion, OR (95% CrI) = 1.67 (1.21 – 2.27). We also found an indication that high scores nurses' team level of neuroticism were associated with more aggressive behaviour, OR (95% CrI) = 1.23 (.99 – 1.53). Aggressive behaviour was less prevalent in the night shift. Several patients characteristics were associated with more aggressive behaviour, namely young age, bipolar disorder, comorbid personality disorder and comorbid intellectual impairment. Comorbid substance abuse seemed associated with less aggressive behaviour in our sample. The statistical models of verbal and physical aggression were generally comparable. The finding that nurses' team level of extraversion was associated with aggressive behaviour seemed mostly due to verbal aggressive incidents. The finding that nurses' team level of neuroticism was associated with aggressive behaviour predominately existed for physical aggression.

The second part of this thesis assessed the risk of seclusion on acute psychiatric wards (**part II**). We started with giving an overview of the existing knowledge on the influence of nurses on the use of coercive measures (**chapter 5**). In this systematic review, we investigated the quality and results of the current body of evidence on the attitude of nurses towards coercive measures and the influence of nursing staff characteristics on the use of coercive measures. In scientific literature, two major themes characterise the attitude of nurses towards coercive measures. The first theme is that the attitude of nurses shifted from a therapeutic paradigm (i.e. coercive measures have mainly therapeutic properties) to a safety paradigm (i.e. coercive measures have mainly security properties). Currently, nurses consider coercive measures as undesirable, but necessary as last resort to protect patients, staff members and visitors from dangerous behaviour of patients. Nurses expressed a

preference to the least intrusive intervention. The latter observation leads to the second major theme, the perceived necessity of less intrusive alternative interventions, especially to prevent the use of seclusion and restraint. However, there is no consensus in literature and practice on the intrusiveness of the different coercive measures. The assessment of intrusiveness seems dependent to usual practice of institutions, regions and countries. Nurses that use seclusion as measurement of last resort tend to view seclusion as less intrusive than mechanical restraint and vice versa. This illustrates that a more objective measure of the intrusiveness of coercive measures is currently impossible. In this review, we also assessed the literature on nursing staff characteristics associated with coercive measures. The literature on this matter is inconclusive and the quality of the investigated studies varied extensively. Based on the existing literature, we could not draw any firm conclusions on this topic.

In the second part of our research on seclusion, we investigated the influence of nursing staff on the use of seclusion on an acute psychiatric ward, using a prospective observational design. In **chapter 6**, we describe the results of five months of data collection on specifically demographic, professional and shift characteristics of the nursing team. After multivariable regression analyses, we found a (trend level) association between female gender and more seclusion, OR (95% CI) = 2.71 (.44 - 16.71). We also found a (trend level) association between large physical stature and less seclusion, OR (95% CI) = .27 (.07 – 1.04). The latter seemed to be most robust after correcting for confounding. After the full two-year data collection period, we analysed the influence of the nursing team with a cross-classified multilevel model. In **chapter 7**, we describe associations of nursing team demographic, professional and psychological characteristics and shift characteristics with the incidence of seclusion, which we analysed with the logistic cross-classified multilevel model. We found an association between teams with only male nurses and less seclusion, OR (95% CrI) = .28 (.05 – .81). We also saw a potential association between higher team scores on personality trait openness and less seclusion, OR (95% CrI) = .70 (.40 – 1.11), although not statistically significant at $p < 0.05$ level. Nurses used less seclusion during night shifts, OR (95% CrI) = .41 (.18 – .84). Patients' young age, bipolar disorder, other diagnosis than bipolar or psychotic disorder, involuntary admission and psychiatric comorbidity (e.g. personality disorder) were associated with more seclusion.

The third part of this thesis is on advanced methodology in aggression research (**part III**). We performed a simulation study in which we tested the cross-classified multilevel model (CCMM) (**chapter 8**). We simulated several scenarios, varying in sample size, standard error and number of clusters to assess in which scenario CCMM is preferable to general multilevel analysis in clinical research. We defined cross-classification due to non-hierarchical relation between patients and staff teams as “patient and shift effects”. We found that patient and shifts effect caused little bias in the effect sizes of the covariates in the simulated statistical models. However, we found that when ignoring the cross-classified structure, the standard error of the (fixed) covariates is underestimated. Consequently, this might lead to biased inference about statistical significance (i.e. Type I error).

Methodological considerations

In this thesis, we investigated the influence of factors on the incidence of aggression and seclusion. I will discuss methodological considerations on the studies we performed on the psychiatric closed admission ward of the Academic Medical Center, nowadays part of Amsterdam University Medical Centers (**chapters 2, 4, 6 and 7**). Incidence of aggression and seclusion are highly complex phenomena, of which no isolated cause can be determined. To deal with this complexity, we combined literature research with quantitative and qualitative research methods. We performed quantitative research methods with highly advanced statistical methods, to minimise the risk of bias due to complex data structures.

However, the interpretation of the findings presented in this thesis must take into account the following limitations. We used a cohort study with a two-year study period to investigate the influence of nursing staff characteristics on seclusion and aggressive behaviour. Because of the observational and naturalistic nature of the study, we cannot draw firm conclusions on causal inferences of our findings. We corrected for a large number of covariates in the statistical model to increase the validity of our findings. However, we cannot rule out the existence of residual confounding by unmeasured covariates. The structure of the data is complex and so is the appropriate analysis of the data. Logistic regression analysis assumes that all observations are independent (2). In case of clustered (i.e. dependent) data, the variance of the model is overestimated which could result in a Type I error (assumption of a significant difference due to underestimated standard errors) (3). By using the cross-

classified multilevel model in **chapters 4 and 7**, we aimed to prevent Type I errors in this thesis. However, the mathematical complexity of this model in combination with limited sample sizes makes it necessary to be cautious in interpreting the results.

As mentioned earlier, the incidence of aggressive behaviour and seclusion are complex phenomena and thereby, complex to investigate. We performed quantitative and qualitative research on our closed admission ward to assess this subject from different perspectives. We acknowledge that several factors could be of major influence on aggressive behaviour and seclusion, but were not part of our data collection. The first is the current psychiatric state of the patient. We aimed to measure the state of the patient at admission with the Global Assessment of Functioning (GAF) (4) and the Health of Nation Outcome Scale (HoNOS) (5). Unfortunately, due to poor quality of the data, we had to exclude these variables from the final analysis. Moreover, the psychiatric state patient on acute psychiatric wards can change rapidly, so admission status might not have been valid enough to give insight on this matter. We assume that the current state of patients can have influence on the risk of aggression and seclusion, as previous research suggested that patient that show more severe psychiatric symptoms are more at risk for aggressive behaviour and seclusion (6, 7). Secondly, we assume that interaction between staff members and between staff and patients can have major influence on our outcomes. Aggressive behaviour mostly occurs in patient-staff interaction (8, 9). With accurate and valid information concerning these interactions, we would have been able to account for this important factor. However, to the best our knowledge, there are no reliable instruments to measure patient-staff interaction on closed psychiatric admission wards. Thirdly, we analysed nursing staff characteristics on team level. As a result, we cannot draw any conclusions on the influence of individual characteristics of the nurse. However, seclusion are generally decisions of the nursing shift team and not of an individual nurse (10). A more important limitation is that we were not able to measure the interaction between nurses in the shift team, which might affect the use of seclusion and other coercive measures. Although some instruments exist to measure staff interaction (11), these instruments measure interaction on a general level instead of measuring the interaction during a nursing shift.

We performed our qualitative and quantitative studies on a single research ward. The patient and staff population of this ward is roughly comparable to other acute admission

wards in the Netherlands, despite of the situation in a university hospital. However, we know from literature that the influence of patients and nurses on the use of seclusion and the incidence of aggressive behaviour varies between wards. Some of our findings might be specific to this ward and not necessarily for acute admission wards in general. Therefore, due to the single research ward, generalisability of our findings might be limited.

The final limitation is the potential influence of quality improvement projects on the incidence of aggressive behaviour and the use of seclusion. Prevention of aggression and seclusion is a “hot topic” in international mental health care (12). The closed admission ward of our interest conducted several quality improvement projects before and during the data collection period, such as the implementation of *High Intensive Care* (13) and the implementation of the *First Five Minutes* training (14). Because of these projects, the risk of aggression and seclusion changed during the study period. Because of the constant quality improvement of hospitals, this is inevitable. Unfortunately, we have no data on the magnitude of this effect, which makes it a potential source of information bias.

Interpretation

In scientific literature, we found that nurses consider seclusion (or restraint, depending on the country) as a necessary intervention to respond to dangerous patient behaviour, which is mostly aggressive behaviour. In our cohort study, we found that shift teams with predominantly female nurses are more likely to use seclusion. Based on our systematic review, we conclude that the effect of nurses’ gender is ambiguous. Some studies support our findings (15, 16); others find contrary effects or no difference between male and female nurses (17-22). Most of these studies had relatively small sample sizes, short data collection periods and/or a single ward for data collection. A possible explanation is that the effect of gender on seclusion is highly specific for a wards’ team, which makes it informative for a specific nursing team, but hardly generalisable to other wards. Another explanation for these differences could be that our findings are more robust since they originate from a prospective study with a relatively large sample size. A second finding, although not significant on a $P < .05$ level, in our cohort study was an association between high mean scores of nursing shift teams on the openness personality trait and lower odds of seclusion. Openness (or openness to experience) is a personality traits that is characterised by

curiosity, creativity, sensitive to emotions of others, risk-taking and willingness for new experiences (23). It could be that teams with high mean score on openness would be willing to avoid seclusion because of the motivation to try to avoid seclusion and perhaps the sensitivity to negative emotions of the patients regarding seclusion. Pawlowski and Baranowski (24) used a different personality test - Gough's Adjective Check List (25) - in their study of the association of nurses' personality and initiation of coercive measures. They found that a low score on the creativity subscale was a strong predictor for initiation of coercive measures (24). Although comparison of different personality models is difficult, our findings are potentially in line with this previous finding.

In our qualitative study, we found that patients and nurses share some views on the predecessors of aggressive incidents, but differ on the *perceived severity* of the incident. Patients tend to consider aggressive incidents less severe than nurses do. Other studies that compared the view of patients and nurses on the cause of the same aggressive incident also found differences, but did not conduct further analyses of the nature of these differences (9, 26). In our cohort study, we found that teams with predominantly male nurses encounter less patient aggression compared to teams with predominantly female nurses. Since aggressive behaviour is the main cause for the use of seclusion, it makes sense that teams with predominantly female nurses are associated with both seclusion and aggressive behaviour. Previous research also describes the association between female nurses and aggression, although it is limited in number of publications (6). Besides nurses' gender, we found that nursing teams with higher mean scores on personality traits extraversion or neuroticism seem associated with more aggressive incidents. Extraversion is a personality trait that is characterised by social and dominant individuals, who are full of energy and enjoy interaction with other people (23). Neuroticism is a personality trait that is characterised by the disposition for negative thoughts and anxiety; neurotic individuals tend to be emotionally unstable and sensitive for stress (23). After analysis of verbal and physical aggression separately, we found that extraversion was primarily associated with verbal aggression and neuroticism with physical aggression. Our study is, to our knowledge, the first to investigate the association between nursing staff personality traits (measured at shift team level) and aggressive patient behaviour using the Five-Factor Model (1). Two earlier studies used other personality tests and provided no support for our findings. Bilgin, Keser

Ozcan (27) found that physical assault was associated with low scores on so called interpersonal styles (this style is somewhat comparable to personality trait openness). Başıoğlu, Arabacı (28) found associations between more verbal aggression and sociotropy, a personality trait somewhat comparable to agreeableness.

A potential explanation for the association of extraversion and verbal aggression could be that extravert nurses have more interaction with patients, which could result in being more at risk for verbal aggressive behaviour due to patient-staff interaction. Another possibility is that nurses with higher scores on the extraversion subscale are experienced as more dominant. Neuroticism is associated with avoidance of possibly dangerous situations, which could be a possible explanation of the association we found with physical aggression. Early de-escalation of nurses can prevent physical aggression to emerge (29). However, for de-escalation of possible upcoming aggression, nurses need to reach out to patients, which can cause fear and stress in nurses. People who tend to avoid fearful experiences might also avoid early de-escalation, which could increase the chance those situations to escalate to physical aggression. However, due to the explorative nature of our study, these suggestions serve as hypotheses for future examination.

Implication for clinical practice

The prevention of aggressive behaviour and seclusion is an important ambition of Dutch mental health care. The use of seclusion in the Netherlands decreased substantially in recent years, despite failing to meet the original ambition of 10% reduction each year (30, 31). To decrease the use of seclusion further, several quality improvement programs are available in the Netherlands and the rest of the world, on different levels of patient care. Organisational models *High Intensive Care* (13, 32, 33) and *Six Core Strategies* (34, 35) focus on the organisation of psychiatric wards from the start of building to clinical leadership. *Safewards* gives several interventions to prevent conflict and coercion and improve the wards' treatment climate (36, 37). These quality improvement programs have several differences, but all acknowledge the importance of skilled nursing staff. An important focus of quality of care on acute psychiatric wards is personal contact between patients and staff members to make ensure wards' safety. Establishing contact with patients might very well be one of the most important skills of nurses on acute psychiatric wards (13, 38, 39). Interactive

engagement instead of reactive engagement is helpful to establish a recovery-focused atmosphere (40). However, to establish contact with patients with severe mental illness is not straightforward and nurses could use support in developing these skills further. We found indications that nursing teams with high scores on the openness scale are less prone to use seclusion and that higher score of teams on extraversion and neuroticism scales are associated with more aggressive behaviour. If these findings are causal, they can serve as indication of improving contact skills of nursing staff. In the next sections, I speculate further on the implications of these findings.

Establishing contact with severe ill psychiatric inpatients can be challenging and sometimes call for unusual interventions. An example is the Safewards intervention *Know Each Other* (41). The ward present staff members with their picture and their role on the ward. Staff members provide some information about themselves, such as their favourite TV-show, hobbies or their experience in mental health care (41). By opening up about themselves, nurses aim to break the ice if connecting with patients is difficult. Personality trait openness is broader than opening up to other people; it also stands for creativity and the willingness to take risks if necessary. These qualities also seem important for nurses' de-escalation skills and for the decision-making process for the use of coercive measures. After all, not using seclusion can induce feelings of fear and insecurity and nurses have to cope with that (12). To support nurses on diminishing the use of seclusion, a focus of mental health institutions on the prevention of aggressive behaviour is essential. Nurses should be stimulated to use their creativity and knowledge about patients to keep contact to patients and thereby, making maximum effort to de-escalate aggression and subsequently prevent seclusion. Therefore, our finding that openness of nurses might be important to prevent seclusion can serve as direction to target support and training of nurses in de-escalation skills and making decisions on using coercive measures.

Concerning the influence of nursing staff on the incidence of aggressive behaviour, we found an association between high levels of personality trait extraversion and verbal aggression and a possible association between high levels of personality trait neuroticism and physical aggression. As mentioned earlier, a possible explanation is that extravert nurses search out to establish contact with their patients. Aversive stimuli, such as frustration, activity demand or physical contact precede the incidence of aggressive behaviour (42). By pushing the limits,

nurses might cross patients' personal boundaries resulting in verbal aggression. Their disease affects personal boundaries of psychiatric inpatients. For instance, earlier publications suggest that patients while being in a manic condition have an expansive personal space (and cross other people's boundaries) and psychotic patients have a small and more vulnerable personal space (43). Staff members that put more effort in making contact with patients or make contact more straightforward might interfere with the patients' *options to leave*. The option to leave unpleasant situations has proven to be an indispensable aspect of cooperative interaction in several settings for both people and other species (44). Therefore, trying too hard (or to extravert) to make contact with patients might be a risk factor for aggressive behaviour. However, avoid making contact with patients might be a risk factor for aggressive behaviour too. Anxiety during apprehensive situations by nurses could fail to de-escalate potentially dangerous situations (45). Neuroticism is associated with anxiety and the desire to control the environment (23). However, unexpected and unmanageable situations are almost inherent to acute psychiatric wards, which negatively influences nurses' sense of control (23). Patient characteristics contribute to these properties, for instance, we saw in our cohort study (**chapter 4**) that patients with bipolar disorder and psychiatric co-morbidity such as personality disorders increase the risk of aggressive behaviour. Organisational aspects can also influence the sense of control of nurses, for instance because of acute admissions outside business hours, as we observed in the Pennsylvania database (**chapter 3**). Lack of sense of control probably affects every nurse on duty, but it might affect nurses with high scores on the neuroticism scales in a way that they get too cautious to de-escalate patient behaviour effectively. Future research could focus on these (and other) organisational variables to affect the work of nurses with different personality profiles. We suggest that the sense of control and the sensitivity of nurses for lack of sense of control may be an important feature in the prevention of aggressive behaviour.

We speculate about the influence of patients, staff members and organisational issues on the sense of control of nurses on acute psychiatric wards. In order to allow nurses to prevent and de-escalate aggressive behaviour, training and organisational support are necessary. Psychiatric nursing changed during the last decades from a paternalistic model towards prevention, promoting of self-management and shared decision-making. Personal contact with patients is essential to prevent (compulsory) admission, coercive measures and adverse

events. In recent years, this topic received increasing attention in nursing education and professional literature. The development of nursing skills to establish contact might contribute directly to the improvement of patient safety and quality of care. Further investment in this development has the potential to improve care for people with severe mental illness substantially. However, we argue that societal developments also play a role in this phenomenon. Based on several incidents, the Dutch public opinion is increasingly negative towards people with severe mental illness (46). Society views deviant behaviour in the street as dangerous and people displaying dangerous deviant behaviour should be locked away in mental health institutions (47). However, society disapproves seclusion and restraint as interventions as well. Popular media and even the Dutch parliament argue that seclusion is archaic and inhumane (48-50). These opinions hold a paradox; mental health institutions must hold dangerous patients in custody to protect society. However, when being inside, institutions cannot use seclusion, restraint or other interventions that are harmful for the patients involved, but protective for other patients and staff members in case of dangerous behaviour. These views might harm patients, but might also influence nurses and their feeling of safety. It might increase the need of nurses to control their surroundings, which could result in more coercive measures or substitution from seclusion to other coercive measures such as forced medication. Furthermore, in recent years, the Dutch government emphasizes on less formal and more informal care in the community, known as the “participation society” (51). The importance of care in the community for people with mental illness increases and the negative public opinion of the public complicate this development.

Society and care organisations cannot change the patients that need care on acute psychiatric wards. They can acknowledge the complexity of acute psychiatric nursing and provide the support nurses need to effectively do their work and make sure that acute psychiatric wards are safe places for patients and staff members.

Suggestions for future research

The findings presented in this thesis come from monocentre observational and qualitative studies. Subsequently, replication of our findings in large, multicentre studies would improve

the reliability and generalisability of our conclusions. Our findings can serve as hypotheses for future research.

However, the complexity of this research topic continues to be substantial. The risk of aggressive behaviour and subsequently, the decision of staff members to use seclusion are multifactorial processes. Researchers need to simplify these phenomena to fit it in research designs. Although we used modern research methods that consider this complexity, this project is no exception concerning the tendency to simplify clinical practice. Based on our findings and the findings of others, interaction between individual nurses and patients and between nurses in a team, together with the importance of sense of control of nurses, could be one of the blind spots in the body of knowledge around seclusion and aggression (37, 40). Ideally, researchers cover acute psychiatric wards with cameras and microphones to meticulously register and analyse every interpersonal interaction on such wards. Obviously, due to practical, clinical, ethical and many other challenges, this seems not feasible. However, mixed-method designs and implementation studies that recognise that personal, professional, psychological and clinical features of both sides of the interaction as well as attitude, group dynamics and environmental characteristics, might elucidate the complexity of this topic more than future observational studies as I describe in this thesis. However, research on aggression and coercion on psychiatric wards will still be challenging in many ways.

Besides focus on social interaction on acute psychiatric wards, other themes from this thesis might deserve attention in future research. We argue that our findings around personality traits might indicate that making contact with patients with severe mental illness is a delicate task. To gain knowledge on this matter, we might be able to improve nurses' skills by raising awareness and training on the job. When replicated, this knowledge could also be of use in team composition and recruitment of new staff members for acute psychiatric wards.

Finally, we suggest pursuing further research on the concept *perceived severity*. Nurses and patients that disagree on the course of events of an aggressive incident can negatively influence the therapeutic relationship and thereby, the wards' treatment climate. Further exploration of this topic might improve debriefing of aggressive incidents and could restore

contact between patients and nurses. In addition, it would be interesting to see whether confronting nurses with the feedback of patients (and maybe vice versa) can help nurses to transform this into preventive interventions for the patient involved. The remarkable finding that nurses and patients frequently, soon after the incident, agreed upon the factual course of events can be helpful for this improvement. After all, the course of events might serve as common ground to restore personal contact and could inflict some contemplation about the incident.

Conclusion

The objective of this thesis was to investigate the influence of staff members on the use of seclusion and the incidence of aggressive behaviour on acute psychiatric wards. We conclude that this is a highly complex subject, which need further exploration by scientists, but also by institutions and policy makers. It is unlikely that a panacea exists that magically prevents all aggression and coercion from mental health care. Mental health care took great steps in reducing aggression and coercion, so further reduction is challenging. However, we speculate that nurses, especially their ability to making contact to patients and install, restore or maintain collaboration, together with their ability to respect patients' boundaries and autonomy, are part of most possible solutions to improve clinical practice in this field. Working as a nurse is a challenging profession and those who chose to do so deserve maximum support. If nurses feel safe to engage with patients, getting close and de-escalate, with respect to patients' personal boundaries, psychiatric nursing can take a step further in creating safe psychiatric wards. This calls not only for improving nursing skills, but also the environment of psychiatric wards should stimulate engagement of nurses with patients (13, 52). Because the vulnerable patients of acute psychiatric wards and their nurses, deserve a safe and comfortable environment. If the findings of this thesis can help to reach that goal, I have met my principal objective.

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**UNLOCK
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Summary

Seclusion of patients on psychiatric wards is a controversial intervention with risk of serious adverse events. Mental health facilities in the Netherlands still use this safety measure to prevent danger to occur. Seclusion is the isolation of patients in a locked room, with tamper-proof decoration and without other people present in the room. Several quality improvement projects in the Netherlands led to a substantial decrease of the number of seclusions in the last twenty years. Despite the ambition, mental health care did not achieve total abandonment of seclusion to this day. The Netherlands is no exception, coercive measures on psychiatric wards is subject of debate worldwide and there are numerous initiatives to prevent such as much as possible. The main reason to use seclusion is (the risk of) aggressive behaviour of patients. Nurses have an important role in the decision to use seclusion when encountering aggressive behaviour. The aim of this thesis is to improve knowledge about the influence of nurses on the incidence of aggressive behaviour and the use of seclusion, in order to use that knowledge to prevent such events in the future.

Part I: Risk of aggression & adverse events on acute psychiatric wards

Aggressive behaviours on psychiatric wards occur mostly during patient-staff interaction. As a result, nurses and other frontline staff members of psychiatric wards have increased risk of being the victim of aggressive behaviour. Aggression often occurs when staff members hinder patients in achieving their goals. This raises the question how patients and nurses evaluate aggressive incidents. In **chapter 2**, I describe a qualitative study with the grounded theory approach to investigate the perspectives of patients and nurses towards aggressive incidents and their recommendations to prevent aggression in the future. The analyses of perspectives resulted in the finding that patients and nurses described similar course of events of the aggressive incidents. The interpretation of the severity of the aggressive behaviour differed however. Because of the subjective nature, we named this concept *perceived severity*. Perceived severity is the subjective severity of aggressive behaviour perceived by the aggressor, victim or witness. Furthermore, patients and nurses gave different recommendations regarding prevention of aggressive incident. Patients typically gave highly personal recommendations, primarily usable for their own specific situation.

Nurses mentioned recommendations on more general level, such as earlier admission of less restrictive interventions or changes in the ward facilities. This led to the conclusion that the facts of aggressive incidents can serve as basis for debriefing of the incident with patients. Secondly, patients proved to be capable of giving valuable advice for prevention of aggression in the future for their own situation.

Aggressive behaviour is an adverse event that is frequent on psychiatric wards. Aggression and other adverse events can lead to safety hazards on psychiatric wards. To give a broad perspective on these events that treat patient safety, I report the results of a study on predictors for adverse patient events and medical errors in a large dataset of 14 hospitals from the Pennsylvania Health Care Cost Containment Council in **chapter 3**. Longer stay in the hospital, old age, weekend admission and Medicare/Medicaid health insurance were associated with higher risk of adverse events and medical errors.

Subsequently, I focussed on quantitative research specifically on aggressive behaviour. Aggressive behaviour emerges mostly during patient staff interaction. Therefore, it is important to gain information about which factors of patients and nurses influence the incidence of aggressive behaviour. In **chapter 4**, I describe the results of a study on verbal and physical aggression on an acute psychiatric ward over the course of two years. I analysed the data by looking at risk factors of patient, nursing staff and shift variables, with special attention of personality traits of nurses. Teams with a high number of male nurses were associated with less aggressive behaviour. Teams with higher mean score of personality trait extraversion were associated with more aggression, although this was primarily the case for verbal aggression. Teams with higher mean score on personality trait neuroticism were associated with more physical aggression, although this association was not statistically significant on $p < .05$ level. Aggressive behaviour was less prevalent during night shifts. Young age, diagnosis of bipolar disorder and psychiatric comorbidity (personality disorder and intellectual impairment) were patient characteristics associated with more aggressive incidents. Comorbid substance abuse was associated with less aggression.

Part II: Risk of seclusion on acute psychiatric wards

Seclusion is an intervention with no proven therapeutic benefits, despite several studies on that matter. Seclusion is, however, associated with iatrogenic damage and adverse events for patients. Nurses are ambivalent towards the use of seclusion because of these dangerous consequences on the one hand, and the role of seclusion to respond to immediate treats due to aggressive behaviour on the other hand. Nurses and other frontline staff members have a major role in the decision to use seclusion. In recent years, several systematic reviews reported on the influence of nurses on seclusion and other coercive measures. However, a systematic review that integrates both the theme of attitude and the theme of other characteristics is lacking. In **chapter 5**, I describe the results of a systematic review to describe both attitude and other characteristics. The first theme from the results was the shift in the attitude toward seclusion from a therapeutic paradigm towards a safety paradigm. This means that nurses see coercive measures less as therapeutic instrument, but more as safety instrument to protect patients, staff members and visitors from dangerous patient behaviour. Nurses consider coercive measures important as intervention of last resort when encountering these dangerous situations. In addition, for these situations nurses have need for less intrusive interventions. This is the second major theme from literature concerning attitude. Nurses find seclusion and restraint highly intrusive and prefer to use interventions with less impact for patients. However, there is little agreement in literature and practice on the intrusiveness of coercive measures. Nurses from countries accustomed to use seclusion as last resort intervention view restraint as more intrusive than seclusion, while nurses from countries accustomed to restraint have opposite views. Studies on the influence of nurses' characteristics on the use of coercive measures are inconclusive, to an extent that firm conclusions on this matter were impossible.

In literature, several studies are available on the influence of nurses' characteristics on the use of seclusion. These studies have high diversity in methodology and outcomes. These studies have high diversity in methodology and outcomes. A major limitation of several studies is that these measure the influence of nurses on a day-to-day basis, while nurses usually in shifts of eight to nine hours. Several studies report on the influence of demographic (e.g. gender, age) and professional (e.g. educational level) characteristics. Less knowledge is available about the influence of personality traits of nurses. In a prospective

study on seclusion on acute psychiatric wards, we investigated the influence of nursing teams on seclusion. In **chapter 6**, I describe the results of a pilot study, in which we analysed part of the dataset. In this analysis, we found associations between more seclusion and more female nurses and more nurses with small physical stature in a shift team. Both associations were strong, though statistically not significant at $p < .05$ level. A possible cause of this was the small sample size. In **chapter 7**, I describe the analysis of the full dataset. We analysed patient, shift and nursing team (demographic, professional and Five Factor Model personality traits) characteristics. We found a strong association between more seclusion and high numbers of female nurses in a shift team. Furthermore, we found a (non-significant) association between high mean score of personality trait openness and less seclusion. Less seclusion occurred during night shifts. Patients of young age, diagnosed with bipolar disorder and other diagnosis than psychotic or bipolar disorder, involuntary admission and psychiatric comorbidity (e.g. personality disorder) were more at risk of seclusion.

Part III: Advanced methodology in aggression research

There are several challenges when performing scientific research on coercive measures and aggressive behaviour on acute psychiatric wards. Besides practical and ethical challenges, researcher encounter methodological issues. The structure of datasets is one of these. For analysis of risk factors, researchers mostly use regression techniques. Because of hierarchical clustering of data, multilevel analysis is necessary. An example of a hierarchical data structure are patients that clustered within wards and wards clustered within hospitals. In research on the influence of nurses on a patient outcome, clustering of data is also an issue. However, there is no strict hierarchical clustering between patients and nurses. Literature refers to clustering of data without a hierarchical structure (as described in chapters 4 and 7) as cross-classification. In this case, patients encounter several nursing shifts (or shifts teams) during their admission. As a result, there is clustering of these shift teams within individual patients. However, the opposite is also true. Nursing shift teams care for more than one patient on a ward. Thereby, there is clustering of patients within nursing shift teams. In order to calculate reliable estimates of risk factors, we used the cross-classified linear model (CCMM). Several simulation studies are available which tested CCMM in social sciences. For instance when performing research of students in schools, in which schools are possibly

cross-classified with the neighbourhood were students live. These simulations showed no bias of the effect estimates when ignoring the cross-classified data structure, but the standard error is systematically underestimated. Underestimation of the standard error can lead to Type I errors, in which a statistical significant effect is assumed incorrectly. However, no simulation studies are available that investigate if these findings are generalisable to the data structure as described in chapters 4 and 7. In **chapter 8**, I describe the results of a simulation study, which compares different statistical techniques to investigate which technique results in the most reliable estimates. The simulations showed that the use of CCMM had no influence on the effect size of the covariates in the regression model. However, when ignoring the cross-classified data structure resulted in systematically underestimation of the standard errors were systematically underestimated. This led to higher risk of a Type I error, especially in p-value oriented studies.

Putting it all together

In this thesis, we performed research on the influence of nurses on seclusion and aggressive behaviour using robust study designs, advances analysis techniques and triangulation by using literature, quantitative and qualitative research. We performed data collection of the qualitative study (chapter 2) and the observational study (chapters 4, 6 and 7) on the closed admission ward of Amsterdam UMC, location Academic Medical Center. Therefore, it is possible that (part of) the findings emerged due to ward specific phenomena and are not generalisable to other wards. We measured the influence of nurses on shift team level and ignored the influence of individual nurses.

Prevention of aggressive behaviour and coercive measures is an important goal for modern health care. In order to achieve prevention, personal contact between patients and nurses is of vital importance. There are no golden solutions to improve safety of psychiatric wards, but increased attention of development of nursing skills seems as an important step forward. When providing optimal nursing care, vulnerable patients on psychiatric wards receive the care they deserve.

Nederlandse samenvatting

Separatie van patiënten op psychiatrische afdelingen is een controversiële interventie met risico op ernstige nadelige effecten. Deze veiligheidsmaatregel wordt in Nederland nog steeds gebruikt om gevaar af te wenden. Separatie is het insluiten van patiënten in een slagvast ingerichte ruimte, zonder de aanwezigheid van andere mensen. Echter, diverse kwaliteitsverbeteringsprojecten hebben een sterke daling van het aantal separaties tot gevolg gehad in de laatste twintig jaar. Ondanks de ambities is het helaas nog niet gelukt om hier helemaal mee te stoppen. Hiermee is Nederland geen uitzondering, in de hele wereld worden discussies gevoerd over de rol van verplichte zorg op psychiatrische afdelingen en zijn er inspanningen om dit zoveel mogelijk te voorkomen. De voornaamste reden voor separatie is (risico op) agressief gedrag van patiënten. Verpleegkundigen spelen een substantiële rol bij de beslissing om tot separatie over te gaan bij agressief gedrag. Het doel van dit proefschrift is om de kennis over de invloed van verpleegkundigen op het ontstaan van agressie en het gebruik van separatie te verbeteren, om hopelijk in de toekomst in te kunnen zetten voor preventieve maatregelen.

Deel I: Risico op agressie & ongewenste gebeurtenissen op acute psychiatrische afdelingen

Agressief gedrag op psychiatrische afdelingen ontstaat meestal in de interactie tussen patiënten en verpleegkundigen. Als gevolg hiervan hebben verpleegkundigen en andere directe zorgverleners op psychiatrische afdelingen een verhoogd risico om het slachtoffer te worden van agressief gedrag. Agressie ontstaat vaak wanneer patiënten beperkt worden bij het realiseren van hun wensen. Hieruit ontstaat de vraag hoe patiënten en verpleegkundigen terugkijken op agressieve incidenten. In **hoofdstuk 2** beschrijf ik een kwalitatief onderzoek met de “grounded theory” methode naar de perspectieven van patiënten en verpleegkundigen na agressieve incidenten en hun aanbevelingen om agressie in de toekomst te voorkomen. Uit de analyse van de perspectieven van patiënten en verpleegkundigen bleek dat zij (bij een meerderheid van de incidenten) het incident in vergelijkbare bewoordingen beschreven. Er leek overeenstemming over de feiten zoals het incident gebeurd is. Echter, er bestonden ook verschillen tussen beide perspectieven. Het

meest prominente verschil was bij de interpretatie van de ernst van de incidenten. Wij noemen dit de subjectieve ernst (of: “perceived severity”). De ervaren ernst is een subjectief fenomeen, gedefinieerd als de interpretatie van de ernst van het agressieve incident door het slachtoffer, agressor of omstanders. Daarnaast waren er verschillen in de aanbevelingen van patiënten en verpleegkundigen om agressie in de toekomst te voorkomen. De patiënten gaven zeer persoonlijke aanbevelingen, primair toepasbaar op hun persoonlijke situatie. De aanbevelingen van de verpleegkundigen waren meer op generiek niveau, zoals eerder interveniëren met niet-restrictieve interventies of veranderingen in de faciliteiten van de afdeling. De conclusie was dat de feiten rondom het agressieve incident als basis kunnen dienen voor de evaluatie van het incident. Daarnaast kunnen patiënten, ongeacht hun psychiatrische toestand, waardevolle adviezen geven over preventie van agressie voor hun eigen situatie.

Agressief gedrag is een ongewenste gebeurtenis die regelmatig voorkomt op acute psychiatrische afdelingen. Agressie en andere ongewenste gebeurtenissen kunnen voor gevaarlijke situaties zorgen voor patiënten op deze afdelingen. Om een breder perspectief te geven op ongewenste gebeurtenissen in deze context beschrijf ik in **hoofdstuk 3** een onderzoek naar voorspellende factoren voor ongewenste gebeurtenissen en medische fouten in een grote dataset van veertien ziekenhuizen uit van de Pennsylvania Health Care Cost Containment Council. Hieruit kwam dat een langer verblijf in het ziekenhuis, oudere leeftijd van de patiënt, een opname in het weekend en Medicare/Medicaid zorgverzekering geassocieerd waren met een hoger risico op ongewenste gebeurtenissen en medische fouten.

Vervolgens richt ik mij op kwantitatief onderzoek specifiek naar agressief gedrag. Omdat agressief gedrag vaak ontstaat in interactie tussen patiënten en verpleegkundigen is het belangrijk om te weten welke factoren bij patiënten en verpleegkundigen het ontstaan van agressief gedrag beïnvloeden. In **hoofdstuk 4** beschrijf ik een onderzoek naar verbale en fysieke agressie op een acute psychiatrische afdeling. Gedurende twee jaar zijn gegevens verzameld over verbale en fysieke agressie. In de analyse heb ik gekeken naar factoren bij patiënten, verpleegkundige teams en de afdeling, met speciale aandacht voor persoonlijkheidskenmerken van verpleegkundigen. Uit de analyse bleek dat meer mannelijke verpleegkundige tijdens een dienst werd geassocieerd met minder agressieve incidenten.

Daarnaast was een hogere gemiddelde score op persoonlijkheidskenmerk extraversie van verpleegkundigen in een dienst geassocieerd met meer agressieve incidenten, dit gold met name voor verbale agressie. Verder leken er aanwijzingen te zijn dat hogere gemiddelde score op persoonlijkheidskenmerk neuroticisme van verpleegkundigen in een dienst geassocieerd met meer agressieve incidenten, dit gold met name voor fysieke agressie. Agressief gedrag kwam minder vaak voor tijdens nachtdiensten. Er waren sterke associaties te zien tussen meer agressie en patiëntkenmerken, namelijk jonge leeftijd, bipolaire stoornis en comorbide persoonlijkheidsstoornis of verstandelijke beperking. Middelengebruik als comorbiditeit bleek geassocieerd met minder agressie.

Deel II: Risico op separatie op acute psychiatrische afdelingen

Separatie is een interventie waarvan geen therapeutische voordelen bekend zijn, ondanks wetenschappelijk onderzoek hiernaar. Separatie wordt echter wel geassocieerd met risico op onbedoelde schade en ongewenste gevolgen voor patiënten. Omdat separatie dient als interventie om acuut gevaar weg te nemen zijn veel verpleegkundigen ambivalent over het gebruik van separatie. Verpleegkundigen en andere zorgverleners op acute psychiatrische afdelingen spelen een belangrijke rol in het besluit om separatie toe te passen. In de loop der jaren zijn er diverse systematische literatuuronderzoeken gepubliceerd over de invloed van verpleegkundigen op separatie en andere dwangtoepassingen. Echter, het ontbreekt nog aan een systematisch literatuuronderzoek die bevindingen over de houding van verpleegkundigen ten opzichte van dwangtoepassing combineert bevindingen over invloed van personeelskenmerken op het toepassen van dwang op acute psychiatrische afdelingen. In **hoofdstuk 5** beschrijf ik de resultaten van een systematisch literatuuronderzoek die deze twee onderwerpen samen beschrijft. Het eerste thema uit de onderliggende literatuur is dat de houding van verpleegkundigen tegenover dwangtoepassing in de laatste decennia is veranderd van een therapeutisch paradigma naar een veiligheidsparadigma. Dat houdt in dat verpleegkundigen steeds minder therapeutische waarde aan dwangtoepassingen toekennen, maar dat de nadruk steeds meer ligt op de noodzaak van dwangtoepassingen om patiënten, medewerkers en bezoekers te beschermen tegen gevaarlijk gedrag van (mede)patiënten. Dwangtoepassingen worden belangrijk gevonden als laatste redmiddel bij gevaarlijke situaties. In deze situaties is behoefte aan minder ingrijpende interventies. Dit is het tweede thema uit de onderliggende literatuur. Verpleegkundigen beschouwen separatie

en fixatie als zeer ingrijpend en willen liever minder ingrijpende interventies gebruiken. Echter, er is weinig overeenstemming in de praktijk en de literatuur over de mate waarin een interventie ingrijpend is. Verpleegkundigen uit landen die gewend zijn om separatie als laatste redmiddel te gebruiken vinden fixatie vaak de meest ingrijpende interventie, terwijl voor verpleegkundigen uit landen waarbij fixatie het meest gebruikte laatste redmiddel is het tegenovergestelde geldt. De literatuur over de invloed van verpleegkundigen op dwangtoepassing bevat zeer veel variatie, zodanig dat er op dit punt geen duidelijke conclusies getrokken kunnen worden.

In de literatuur zijn diverse studies gepubliceerd over de invloed van verpleegkundigen op separatie. Onder deze studies bestaat grote variatie in methodologie en uitkomsten. Een belangrijke beperking is dat invloed van verpleegkundigen vaak van dag tot dag wordt gemeten, terwijl verpleegkundigen doorgaans werken in diensten van acht tot negen uur. Er zijn diverse studies gepubliceerd over de invloed van demografische (zoals leeftijd en geslacht) en professionele (zoals opleidingsniveau) van verpleegkundigen. Er is echter minder kennis over de invloed van hun persoonlijkheidskenmerken. In een prospectieve studie naar separatie op een acute psychiatrische afdeling onderzoeken we de invloed van verpleegkundige teams op separatie. In **hoofdstuk 6** beschrijf ik de resultaten van een pilotstudie, waarbij we een deel van de data hebben geanalyseerd. Uit deze analyse kwamen associaties tussen meer separaties en meer vrouwelijke verpleegkundigen en een kleine gemiddeld postuur van verpleegkundigen in de dienst. Beide effecten waren sterk, doch statistisch niet significant. Een vermoedelijke oorzaak hiervan was de kleine steekproef. In **hoofdstuk 7** beschrijf ik de resultaten van de volledige dataset over twee jaar. In dit hoofdstuk zijn patiëntkenmerken, afdelingskenmerken en kenmerken van verpleegkundige teams (demografisch, professioneel en persoonlijkheid gemeten met het Five-Factor Model) geanalyseerd. Hieruit kwam als resultaat een sterke associatie tussen meer vrouwelijke verpleegkundigen in een dienst en meer separatie. Verder werd een (niet-significante) associatie gevonden tussen meer separatie en een lagere gemiddelde score op persoonlijkheidskenmerk openheid. In de nachten werd minder gesepareerd en patiënten van jonge leeftijd met een bipolaire stoornis, een andere diagnose dan bipolaire of psychotische stoornis, gedwongen opname en psychiatrische co-morbiditeit (onder andere persoonlijkheidsproblematiek) hadden een grotere kans om gesepareerd te worden.

Deel III: Geavanceerde methodes voor onderzoek naar agressie

Er bestaan verschillende uitdagingen bij het uitvoeren van wetenschappelijk onderzoek naar dwangmaatregelen en agressief gedrag op acute psychiatrische afdelingen. Naast praktische en medisch-ethische uitdagingen hebben onderzoekers te maken met methodologische kwesties. De structuur van de verzamelde data is daar een van. Bij het analyseren van onderzoek naar risicofactoren wordt meestal gebruik gemaakt van regressietechnieken. Omdat er vaak sprake is van een hiërarchische datastructuur is het gebruik van multilevel analyse noodzakelijk. Een voorbeeld van een hiërarchische structuur is clustering van patiënten binnen afdelingen en afdelingen binnen een ziekenhuis. Bij onderzoek naar de invloed van verpleegkundigen op een uitkomst die wordt gemeten bij patiënten is er ook sprake van clustering. Echter, er is geen strikte hiërarchische verhouding tussen patiënten en verpleegkundigen. Clustering van data zonder hiërarchische structuur zoals in de onderzoeken zoals beschreven in hoofdstuk 4 en 7 wordt “cross-classification” genoemd. In dit geval hebben patiënten gedurende hun opname te maken met meerdere verpleegkundige diensten (of subteams). Daardoor zijn teams geclusterd binnen individuele patiënten. Echter, het tegenovergestelde is ook waar. Verpleegkundige subteams hebben te maken met meerdere patiënten tegelijk op een afdeling. Patiënten zijn dus geclusterd binnen verpleegkundige subteams. Om het effect van de risicofactoren goed te kunnen schatten is gebruik gemaakt van het cross-classified multilevel model (CCMM). Diverse simulatiestudies zijn uitgevoerd om CCMM te testen in de sociale wetenschappen, bijvoorbeeld bij leerlingen op scholen, waarbij scholen cross-classification vertoonden met de wijken waar de leerlingen woonden. Hieruit bleek dat de effectschatters niet afweken door het negeren van de datastructuur, maar dat de standaardfout systematisch wordt onderschat. Een onderschatting van de standaardfout kan leiden tot een Type I fout, waarbij ten onrechte een statistisch significant effect wordt verondersteld. Er zijn echter geen simulatiestudies beschikbaar om te onderzoeken of ditzelfde effect optreedt bij de datastructuur zoals beschreven in hoofdstuk 4 en 7. In **hoofdstuk 8** beschrijf ik de resultaten van een simulatiestudie waarbij verschillende statistische technieken met elkaar zijn vergeleken om te onderzoeken bij welke techniek de effecten het meest nauwkeurig worden geschat. De simulaties toonden aan dat het gebruik van CCMM geen grote invloed heeft op de effectschatting van de covariaten in het regressiemodel. Echter, de standaardfout werd

structureel onderschat door het negeren van een cross-classified datastructuur. Dit leidt tot een grotere kans op Type I fouten, met name in p-waarde georiënteerde studies.

Tot slot

In dit proefschrift is met diverse studiedesigns onderzoek gedaan naar de invloed van verpleegkundigen op separatie en agressief gedrag. Hiervoor is gekozen voor robuuste onderzoeksdesigns, geavanceerde analysetechnieken en triangulatie door het gebruik van literatuuronderzoek, kwalitatieve en kwantitatieve methoden. De kwalitatieve studie (hoofdstuk 2) en de observationele studie (hoofdstuk 4, 6 en 7) werden uitgevoerd op de gesloten opnameafdeling van Amsterdam UMC, locatie Academisch Medisch Centrum. Het is mogelijk dat de bevindingen (deels) kunnen worden verklaard door afdelingsspecifieke fenomenen die niet generaliseerbaar zijn naar andere afdelingen. De invloed van verpleegkundigen is gemeten op dienstniveau, er is niet gekeken naar de invloed van individuele verpleegkundigen.

Preventie van agressief gedrag en dwangtoepassingen is een belangrijke doelstelling van de hedendaagse zorg voor mensen met een psychiatrische stoornis. Voor preventie is contact tussen patiënten en verpleegkundigen onontbeerlijk. Er bestaan geen gouden oplossingen om de veiligheid van psychiatrische afdelingen groter te maken, maar voldoende aandacht voor de ontwikkeling van verpleegkundigen lijkt een belangrijke stap. Door te zorgen voor optimale verpleegkundige zorg krijgen kwetsbare patiënten op psychiatrische afdelingen de zorg die zij verdienen.

PhD portfolio

Name:	Paul Doedens
PhD period:	November 2014 – October 2021
Promotor:	Prof. dr. L. de Haan
Copromotores:	Dr. C.H.M. Latour, Dr. L.L.N.J. Boyette

PhD training & courses

Scientific writing in English	2020
Advanced topics in biostatistics	2019
Guideline & quality standard development	2018
Oral presentation in English	2018
Basic concepts of qualitative research in health care	2017
Clinical epidemiology 2: Observational epidemiology	2017
Computing in R	2017
BROK	2016
Multilevel analysis	2016
Basic didactical qualification	2016

Conference contribution

Oral presentation

Vrijheidsbeperkende interventies in de GGZ	2020
<i>Seminar CDA Verpleegkundigen en Verzorgenden, Den Haag</i>	
Expanding treatment possibilities – development of the Academic High Intensive Care model	2019
<i>11th European Congress on Violence in Clinical Psychiatry, Oslo, Norway</i>	
“Maar ik raakte hem helemaal niet aan!”	2019
<i>Kennis- en innovatiemiddag GGZ Oost-Brabant, Boekel</i>	

Influence of nursing staff personal characteristics on involuntary seclusion in acute mental health care – a prospective cohort study <i>Spring meeting European Violence in Psychiatry Research Group</i>	2019
Exclusion by seclusion – Influence of nurses’ on aggression and the decision to use seclusion <i>International Conference on Crisis, Coercion and Intensive Treatment in Psychiatry, Rotterdam</i>	2018
In the heat of the moment: PAUSE - Patient Advice Used for psychiatric intensive care Safety and de-Escalation <i>Landelijke platformbijeenkomst Dwang & drang GGZ Nederland, Amersfoort</i>	2018
In the heat of the moment: PAUSE - Patient Advice Used for psychiatric intensive care Safety and de-Escalation <i>Fifth International Conference on Violence in the Health Sector, Dublin, Ireland</i>	2017
Description of the chance of aggressive incidents and the use of coercive measures by examining PICU’s nursing staff <i>XXXVth International Congress of Law and Mental Health, Prague, Czech Republic</i>	2017
Exclusion by seclusion – Influence of care workers on seclusion and patients’ advice on prevention <i>Fifth International Conference on Violence in the Health Sector, Dublin, Ireland</i>	2016
Nursing staff factors contributing to seclusion in acute mental health care – a prospective cohort study <i>XXXIVth International Congress of Law and Mental Health, Vienna, Austria</i>	2015
Agressie op opnameafdelingen en de effecten op de veiligheid van (mede)patiënten <i>Voorjaarscongres Nederlandse Vereniging voor Psychiatrie, Maastricht</i>	2015
Bijdrage van verpleegkundigen in het voorkomen van separatie: een interim analyse van een prognostische studie <i>Voorjaarscongres Nederlandse Vereniging voor Psychiatrie, Maastricht</i>	2014
Nurses’ contribution to prevent seclusion in acute mental health care <i>8th European Congress on Violence in Clinical Psychiatry, Ghent, Belgium</i>	2013

Workshops

Van je collega's mag het wel	2015
<i>Kennisfestival HIC: De trein rijdt! Amersfoort</i>	
Maar van je collega mag het wel! Invloed van verpleegkundigen op dwangtoepassing	2014
<i>Tweede landelijke congres: Dwang, drang en agressie, Ede</i>	
Verpleegkundige factoren bij het voorkomen van separatie: een prognostische observationele studie	2014
<i>Steiger congres, Arnhem</i>	

Poster

Acute zorg in het UMC: ontwikkeling van de Academische High Intensive Care Amsterdam	2018
<i>Congres Dwang & Drang, Ede</i>	

Teaching

Teacher bachelor of Nursing, Amsterdam University of Applied Sciences	2014-present
Teacher courses Evidence Based Practice, Academic Medical Center	2014-present

Supervision

Anniek Leijnse, master thesis Evidence Based Practice in Health Care	2021
<i>Measuring group dynamics in an acute psychiatric nursing team</i>	
Lotta Raijmakers, master thesis Clinical Psychology	2017
<i>Predicting aggression within closed psychiatric wards</i>	

Clinical work

Clinical nurse, department of Psychiatry, Academic Medical Center	2009-present
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List of publications

Part of this thesis

Published

Doedens P, Vermeulen JM, Boyette LLNJ, Latour CHM, de Haan L. Influence of nursing staff attitudes and characteristics on the use of coercive measures in acute mental health services – a systematic review. *Journal of Psychiatric and Mental Health Nursing*. 2020;27(4):446-459 doi: 10.1111/jpm.12586

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“De reis is belangrijker dan de bestemming.” Deze uitdrukking wordt door reislustige, spirituele en verlichte types toegeschreven aan diverse klassieke en moderne wijsgeren. Ik ben ervan overtuigd dat ik ooit vanuit dat perspectief naar mijn promotietraject kan kijken. Nu ben ik vooral opgelucht dat de bestemming bereikt is. Een van de belangrijkste lessen uit deze periode is dat ik wél talent heb om nieuwe dingen te beginnen en dat ik géén talent heb om dingen af te maken. Zonder de steun, wijze raad, aanmoediging en strenge blikken van veel belangrijke mensen uit mijn omgeving was dit nooit gelukt. In de wetenschap dat ik daarbij ongetwijfeld mensen vergeet, noem ik er graag een aantal bij naam.

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Onderzoek kan niet zonder participanten. Dank aan alle patiënten die we mochten interviewen en heel veel dank aan alle verpleegkundigen die zonder te morren meewerkten met interviews, vragenlijstjes, dataverzameling en andere tijdrovende zaken.

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deel te danken aan jouw geloof in mijn kunnen en aan jouw overtuiging dat mensen hun eigen pad moeten bewandelen, ook als dit niet het meest voor de hand liggende pad is. Als ik dit tegen je zeg kaats je de bal, bescheiden als je bent, steevast terug. Door dit geschreven woord kan je hopelijk niet anders dan mijn dank zonder voorbehoud te incasseren. Beste Damiaan, jouw inspanning om de kliniek door te ontwikkelen tot wat het nu is, heeft mij de ruimte gegeven om alleen maar mooie dingen te doen. Veel dank daarvoor en op naar meer mooie dingen in de toekomst.

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Mijn familie, ooms, tantes, neven, nichten, alle aanhang en kroost. Kiezen voor een carrière in de zorg is in onze familie geen uitzondering. Kiezen voor promotieonderzoek is echter minder gebruikelijk. Ik kijk weer uit naar onze familiedagen!

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Het zit erop, dit promotietraject. En nu eropuit, de wereld in, op avontuur!

Curriculum vitae

Paul Doedens was born on September 4th 1986 in Alkmaar. He grew up together in small towns in West-Friesland, named Hem and Andijk. He finished pre-university education in 2005 from the Regionale Scholengemeenschap in Enkhuizen. After high school, he attended a bachelor of nursing at the Amsterdam University of Applied Sciences. During his nursing training, he followed the mental health program with internships different types of psychiatric wards. He graduated in 2009 with the bachelor thesis “Refinement seclusion policy of the Penitentiary Psychiatric Center”. After graduation, he started working at the Academic Medical Center on the closed admission ward of the department of Psychiatry. Besides working on the ward, he participated in projects concerning evidence-based practice for nurses, prevention of coercive measures and implementation of electronic health records. In 2011, he started with the Master Evidence Based Practice in Health Care (clinical epidemiology) at the University of Amsterdam. He graduated in 2013 with the master thesis “Nursing staff factors contributing to seclusion in acute mental health care – a prognostic study”. In 2014, Paul started working as a teacher in nursing at the Faculty of Health of the Amsterdam University of Applied Sciences. At the same time, he started his PhD-project “Exclusion by seclusion” under supervision of prof. dr. L. de Haan. From 2016, Paul worked for the majority of his time on his PhD-project and the implementation of the High Intensive Care model at the department of Psychiatrie of the Academic Medical Center, where he still works as a nurse for one day a week. Next to research, clinical work and teaching, he is a Principal Nurse Educator at Amsterdam UMC, member of the European Violence in Psychiatry Research Group and member of the editorial board of Nurse Academy GGZ.

Paul is married to Monique; they live together in Enkhuizen. They met during their volunteer work (which they continue to this day) for the Stichting Vakantiespelen that organises holiday activities for children in the Dijkgatbos.

UNLOCK THE DOORS

Aggressive behaviour and seclusion on closed psychiatric wards

Seclusion of patients on psychiatric wards is a controversial intervention with serious safety issues for patients. Nurses have an important role in the decision to use seclusion when encountering aggressive behaviour. The aim of this thesis is to improve knowledge about the influence of nurses on the incidence of aggressive behaviour and the use of seclusion, in order to use that knowledge to prevent such events in the future.

Patients and nurses share views on the factual cause of aggressive behaviour, but their perception of the severity differ. The attitude of nurses towards seclusion changed over the last decades from a therapeutic paradigm to a safety paradigm. In our study, teams with majority of male nurses were associated with less seclusion and aggressive behaviour. Teams with high scores on personality trait openness were associated with less seclusion and teams with high scores on personality trait extraversion were associated with patients' aggression.

There are no golden solutions to improve safety of psychiatric wards, but increased attention of development of nursing skills seems as an important step forward. By providing optimal nursing care, vulnerable patients on psychiatric wards receive the care they deserve.

Paul Doedens