ORIGINAL ARTICLE

WILEY

A Bayesian network model to identify the associations between the use of seclusion in psychiatric care and nursing managers' attitudes towards containment methods

Emilia Laukkanen[1,2,3] 🄳　|　Lauri Kuosmanen[1]　|　Olavi Louheranta[2]　|
Olli-Pekka Ryynänen[4,5]　|　Katri Vehviläinen-Julkunen[1,6]

[1]Department of Nursing Science, University of Eastern Finland, Kuopio, Finland

[2]Department of Forensic Psychiatry, Niuvanniemi Hospital, University of Eastern Finland, Kuopio, Finland

[3]Finnish Medicines Agency Fimea, Kuopio, Finland

[4]Department of Public Health and Clinical Nutrition, University of Eastern Finland, Kuopio, Finland

[5]General Practice Unit, Kuopio University Hospital, Primary Health Care, Kuopio, Finland

[6]Kuopio University Hospital, Kuopio, Finland

Correspondence
Emilia Laukkanen, Department of Nursing Science, University of Eastern Finland, P. O. BOX 1627, 70210 Kuopio, Finland.
Email: emila@student.uef.fi

Accessible summary

What is known on the subject:

- Seclusion is used frequently in psychiatric care, despite its potential adverse effects.
- Several programmes aiming to reduce the use of seclusion identify leadership and management as key strategies—however, studies concerning leaders and managers are missing.

What the paper adds to existing knowledge:

- Nursing managers' negative attitudes towards seclusion are associated with less use of the measure, and nursing managers' higher age is associated with increased use of seclusion.

What are the implications for practice:

- Nursing managers should be encouraged to guide their staff to reduce the use of seclusion.
- The negative influences of seclusion and the potential of alternative measures should be highlighted in the education and training of psychiatric nursing managers.

Abstract

Introduction: The use of seclusion in psychiatric care should be reduced. The relationship between nursing management or nursing managers' attitudes and the use of seclusion has not been investigated.

Aim: To describe the associations between the use of seclusion and psychiatric nursing managers' attitudes to containment methods.

Method: Register data concerning the use of seclusion in Finnish psychiatric care in 2017 were collected. The Attitudes to Containment Measures Questionnaire was used to illustrate psychiatric nursing managers' attitudes to containment methods. An Augmented Naive Bayes analysis was used to investigate the relationships of the use of seclusion and attitudes.

Results: Nursing managers' age and their attitudes towards containment methods were related to the use of seclusion. Especially nursing managers' negative perceptions of seclusion were associated with less use of seclusion, and seclusion was used more often on wards with nursing managers who were older than the average.

Conclusion: Nursing managers' negative attitudes towards seclusion have a potential impact on the use of seclusion, which might even result in a reduction in its use in psychiatric inpatient setting.

Implications for practice: The results suggest that nursing managers should be encouraged to guide their staff to decrease the use of seclusion.

1 | INTRODUCTION

Seclusion is the most used coercive measure in Finnish psychiatric care (Laukkanen, Kuosmanen, Selander, et al., 2020). It is also one of the containment methods used in psychiatric care all over Europe (Bak & Aggernæs, 2012). According to Bowers (2006), containment methods are methods by which staff minimize or prevent the effects of patients' conflict behaviour. Intrusion, separation and restriction are central characteristics of containment methods; however, containment methods sometimes include coercion, or are occasionally considered as therapeutic methods, or as a part of the care (Bowers, 2006). Methods such as seclusion aim to keep patients safe in times of acute crisis (Bowers et al., 2007).

Seclusion can be defined as the placement and retention of a patient in a locked room (American Psychiatric Nurses Association, 2014) for a period of time (Goulet et al., 2018). It is used frequently in psychiatric care in the containment of disturbed and aggressive patients (Price et al., 2017) despite its possible adverse effects (McLaughlin et al., 2016).

The use of seclusion is a controversial issue from ethical, legal and medical perspectives (Steinert et al., 2010). It can traumatize both patients and staff, interrupt the therapeutic process, and complicate recovery (Huckshorn, 2004). However, seclusion is often considered as a necessary and appropriate measure (Happell & Koehn, 2011; Molewijk et al., 2017). Several strategies have been developed to reduce the use of seclusion (Steinert et al., 2010), such as the Six Core Strategies advocated by Huckshorn (2014).

Multiple different variables are associated with the use of seclusion (Lay et al., 2011; Luciano et al., 2014; Thomsen et al., 2017). Patients' psychiatric diagnoses and substance abuse are considered predictors of seclusion use (Thomsen et al., 2017). However, patient-level characteristics cannot explain the variation comprehensively (Lay et al., 2011). Staff characteristics (Luciano et al., 2014) and staff attitudes (Mahmoud, 2017), among other things, can affect the use of seclusion, as they affect nurses' decisions about whether to use seclusion or other coercive containment methods (Larue et al., 2009).

Generally, seclusion can be considered as a quality indicator of psychiatric inpatient care (Donat, 2003), and management and leadership are core strategies in the programmes that aim to reduce its use (Huckshorn, 2014). Nursing management affects treatment outcomes (Aiken et al., 2017; Pitkaaho et al., 2015; Wong et al., 2013), such as the use of restraint (Wong et al., 2013), and unit performance outcomes (Wong et al., 2015). Nursing management is therefore presumably influencing the use of seclusion as well. There is, however, a definite gap in the literature concerning the association between seclusion—or any other restrictive measure—and nursing leadership/management and nursing managers' attitudes. As nursing staff play an important role in decision-making related to the use of seclusion (Happell & Harrow, 2010), it can be assumed that especially nursing management plays an important role in the reduction of the use of seclusion. Therefore, it is essential to examine nursing managers' attitudes towards seclusion.

1.1 | Background

1.1.1 | Use of seclusion

Seclusion is the most commonly used restrictive measure in psychiatric care in several European countries (Bak & Aggernæs, 2012; Laukkanen, Kuosmanen, Selander, et al., 2020), but differences exist concerning the frequency and duration (Steinert et al., 2010). Additionally, differences in collecting the data (Steinert et al., 2010), variation in data presentation, and different definitions of seclusion complicate international comparisons (Janssen et al., 2011).

In Finland specifically, seclusion is the most used restrictive measure in psychiatric inpatient care (Laukkanen, Kuosmanen, Selander, et al., 2020; Martikainen & Järvelin, 2019), and it seems to be used more frequently in Finland than in other Nordic countries (Bak & Aggernæs, 2012). The Mental Health Act (1116/1990) considers seclusion as a special limitation of patients' fundamental rights, which can be utilized only if the patient is potentially dangerous, hampers the treatment of other patients, jeopardizes their own safety, will

probably cause damage to property, or if other especially weighty therapeutic reasons occur. The physician decides whether seclusion is used or not; however, nursing staff may seclude a patient in urgent situations on a temporary basis (Mental Health Act, 1116/1990).

More than 24,000 patients were taken care of in Finnish specialized psychiatric inpatient care in 2017, and about 4,000 of them were subjected to restrictive measures during care (Vainio et al., 2018). It seems that there has been a reduction in the use of seclusion in Finnish psychiatric inpatient care since 2005 (Martikainen & Järvelin, 2019; Rainio & Räty, 2015; Vainio et al., 2018), but the overall national goal of reducing coercion in psychiatric care by 40% from 2009 to 2015 (Ministry of Social Affairs & Health, 2009) was not realized completely (Martikainen & Järvelin, 2019; Rainio & Räty, 2015; Vainio et al., 2018).

1.1.2 | Attitudes towards seclusion

"Attitude" can be defined as a learned tendency to feel, behave and think in a specific style to a specific target (Erwin, 2001). Attitude is one of the numerous parameters that have an effect on an individual's behaviour (Fishbein & Ajzen, 1975). Although there is no unambiguous proof of one-to-one correspondence between behaviour and attitude (Erwin, 2001; Fishbein & Ajzen, 1975), evidence suggests that nursing staffs' attitudes might have an influence on the utilization of seclusion (Bowers et al. 2010) and other restrictive measures, such as restraint (Mahmoud, 2017). After all, in clinical practice, nurses are the people who strongly influence the decision to use seclusion (Happell & Harrow, 2010).

Nursing attitudes towards seclusion and other restrictive measures have been examined widely (Happell & Harrow, 2010; Laukkanen et al., 2019), but there is a lack of studies investigating nursing managers' attitudes and the associations between attitudes and the use of these measures. The studies by Jalil et al. (2017) and Bowers et al. (2007) included nursing managers as a part of the nursing staff, but the attitudes of nursing managers were not presented separately.

The use of seclusion seems to be broadly accepted among nurses (Happell & Harrow, 2010; Laukkanen et al., 2019), but the attitudes towards seclusion have become more negative over time (Laukkanen et al., 2019). However, there are differences in attitudes at the global level (Bowers et al., 2007; Laukkanen et al., 2019). Previous research in Finland shows that many psychiatric nursing staff strongly disapprove of seclusion as a containment method (Bowers et al., 2007; Hottinen et al., 2012). However, these studies are limited to staff working within forensic psychiatric care (Bowers et al., 2007) and adolescent psychiatric care (Hottinen et al., 2012).

2 | AIMS

The aim of this study was to describe the associations between the use of seclusion and psychiatric nursing managers' attitudes towards containment methods.

3 | DESIGN

This study has a quantitative, cross-sectional descriptive design. The data collected for this study are a combination of register data and survey data.

4 | METHODS

4.1 | Setting and sample

In Finland, municipalities organize the mental health services in their areas, and joint municipal boards for hospital districts organize mental health services regarded as specialized medical care (Mental Health Act, 1116/1990). There are altogether 20 hospital districts in the Finnish mainland (Act on Specialized Medical Care, 1062/1989) and two government psychiatric hospitals that provide specialized psychiatric care. Approximately 200 psychiatric wards across these 22 organizations in Finland offer specialized psychiatric care. In 2017, 140 wards in Finnish specialized psychiatric care used seclusion, restraint or involuntary medication (Laukkanen, Kuosmanen, Selander, et al., 2020).

The root-level register data for this study were collected from all Finnish specialized psychiatric care wards that reported using restrictive measures during 2017. The data consist of the number of all seclusion episodes applied during 2017 on each ward. The questionnaire was sent to all Finnish psychiatric specialized inpatient care nursing managers (head nurses, assistant head nurses and directors of nursing, n ≈ 350) within the 22 organizations.

4.2 | Instruments

A data collection sheet designed especially for this study was utilized to collect the data concerning the use of seclusion. The data collection sheet comprised of questions concerning the number of seclusion episodes per ward and the number of hospital days per ward.

To examine the attitudes of nursing managers, the Attitudes to Containment Measures Questionnaire (ACMQ) was used. ACMQ provides data on attitudes towards containment methods in general, but also enables the examination and analysis of several containment methods individually. When completing the ACMQ, respondents are asked to rate, with a five-point (1 = positive attitude, 3 = uncertain, 5 = negative attitude) Likert scale, 11 different containment methods, generally used in Europe (Bowers et al., 2004). In addition to the ACMQ, the questionnaire surveyed respondents' age, gender, position, education, work experience and the number of staff.

4.3 | Data collection

The register data collection was carried out within a period of 10 months, from January 2018 to October 2018. The data were

collected from all organizations with the assistance of the organizations' information specialists or designated contact persons. No actual patient data were collected; instead, the data were collected from anonymous patient records, and were comprised of ward-level statistics concerning the number and duration of restrictive measures, along with information from the lists of applied measures from each unit.

The survey data were collected during May and June 2018. The electronic questionnaire was sent to the psychiatric nursing managers via designated contact persons in May 2018. A cover letter, with a mention of the voluntary nature of the questionnaire, was enclosed. One reminder was sent in June 2018 to all organizations. The nursing managers were asked to report their units to be able to combine the results with the register data.

The register data and survey data were combined to identify the associations of nursing managers' background information, attitudes to containment methods and the number of seclusion episodes. The number of seclusion episodes was presented in relation to hospital days. If a manager was a supervisor of several different wards that applied restrictive measures, the mean of the number of seclusion episodes was used.

4.4 | Data analysis

We performed the statistical analysis by using the Bayesialab 9.1 tool. The visual form of a Bayesian network uses a DAG (Directed Acyclic Graph), which consists of nodes representing random variables, and arcs between the nodes representing associations between them. A conditional probability table (CPT) is attached for each node to describe the size of statistical dependency (a local conditional dependency) between a child node and its parent nodes (Pearl & Mackenzie, 2018).

The Bayesian approach affords certain advantages over standard frequentist methods in analysing data collected in real practice. For example, Bayesian analysis can handle complicated and small data sets with missing data, outliers, and nonlinear relationships, and the results of the analysis can be presented in a visual form that is easy to interpret (Allmark, 2004; Darwiche, 2010; Sheingold, 2001; van de Schoot et al., ,2014, 2015; Woertman & van der Wilt, 2013).

An augmented Naïve Bayes (ANB) learning algorithm was used, which describes independent variables' associations with the target variable, as well as connections between the independent variables. The network allows controlling one or several variable values to demonstrate their common effect on other variables, including the target variable (Conrady & Jouffe, 2015). Variables can be removed from the model if they do not form any kind of dependency with other variables or if the variables are irrelevant to the study, supposing that they do not act as a confounder between a variable of interest and the target variable. Of the two main structural learning alternatives—constraint-based search and score-based learning—we applied the latter method (Darwiche, 2010; Kekolahti, 2019; Ryynänen et al., 2018).

In the first phase, we performed a preliminary ANB analysis with the total set of one target variable and 99 independent variables. To avoid local minima, the ANB search was supplemented with data perturbation, which adds random noise to the weight of each observation in the data set. Most variables were discrete. The only numerical variable was Age, which was discretized by using Bayesialab's genetic algorithm.

To find an optimal complexity of the model in the ANB learning phase, a structural coefficient analysis (SC) was performed as part of minimum description length (MDL) scoring, and the value SC = 0.6 was used in the analysis. To avoid constructing an overfit model, variables having only a minimal connection with the target node were dropped, leaving a set of seven independent variables and one target variable for final analysis. This reduced data set had no missing values.

The result was a non-causal ANB network model. Bayesialab gives the chance to fix every variable and their combinations to certain values. For example, the variable Age can be fixed to the value "under 42.5 years" = fixed to be 100%. Then, the model gives the values of the outcome in that particular hypothetical case that all subjects in the data set were under 42.5 years of age. We analysed the probabilistic effect of independent variables by fixing each variable's values separately to be 100%.

We calculated mutual information between each variable and the target variable as well as maximum and minimum Bayes Factor (BF) in order to clarify the strength of the dependency mutual information between two variables (X and Y), which shows how much the knowing of variable Y reduces the uncertainty about variable X. BF is a Bayesian approach for hypothesis testing. Kass and Raftery (1995) give the following interpretation for BF: $\log_{10}K = 0–0.5$ not worth more than a bare mention, 0.5–1 substantial, 1–2 strong, and >2 decisive.

4.5 | Validity and reliability

Attitudes to Containment Measures Questionnaire has been validated previously by Dack et al. (2012). In this study, the internal consistency of the ACMQ was assessed with Cronbach's alpha. The internal consistency of the whole questionnaire was high ($\alpha = 0.944$). The alpha of each of the 11 sectors, describing overall attitudes towards each containment method, varied from 0.658 to 0.925. The questionnaire was pre-tested in one organization, and the pre-test data were included in the study. The register data collection sheet was based on legislation and professionals' experiences. The Robustness of arcs was analysed by using Jackknife resampling method in Bayesialab.

4.6 | Ethical considerations

The University of Eastern Finland Committee on Research Ethics has given a supporting statement (2/2017) for this research. Licence to

TABLE 1 Characteristics of the variables

Variable name	Abbreviation	Sample size required for 90% power	N	Min–max	Classification (percentage)	Mean (SD)	Median (IQR)
Number of seclusion episodes/1000 hospital days	Seclusion_Ep		69	0.00–23.74	1 = 0.00–7.99 (68.1%) 2 = 8.00–23.74 (31.9%)	5.99 (5.80)	
Age	Age	58	70	34–65 years	1 = 34–42.5 years (35.7%) 2 = 42.6–51.5 years (32.9%) 3 = 51.6–65 years (31.4%)	46.97 (8.05)	
Seclusion is acceptable	Seclusion_Accept	446	70	1–5	1 = strongly agree (27.1%) 2 = agree (41.4%) 3 = uncertain (10.0%) 4 = disagree (20.0%) 5 = strongly disagree (1.4%)	2.27 (1.12)	2.0 (1.00–3.00)
Seclusion respects patient's dignity	Seclusion_Dignit	1,054	70	1–5	1 = strongly agree (12.9%) 2 = agree (30.0%) 3 = uncertain (12.9%) 4 = disagree (35.7%) 5 = strongly disagree (8.6%)	2.97 (1.24)	3.0 (2.0–4.0)
Seclusion is safe for the patient	Seclusion_Safe_Pt	393	70	1–5	1 = strongly agree (8.6%) 2 = agree (44.3%) 3 = uncertain (20.0%) 4 = disagree (25.7%) 5 = strongly disagree (1.4%)	2.67 (1.00)	2.0 (2.0–4.0)
Intermittent observation is effective	IntObs_Effect	1519	70	1–4	1 = strongly agree (37.1%)^2 = agree (48.6%)^3 = uncertain (4.3%)^4 = disagree (10.0%)	1.87 (0.90)	2.0 (1.0–2.0)
Intermittent observation respects patient's dignity	IntObs_Dignit	5,091	70	1–5	1 = strongly agree (54.3%) 2 = agree (32.9%) 3 = uncertain (5.7%) 4 = disagree (5.7%) 5 = strongly disagree (1.4%)	1.67 (0.93)	1.0 (1.0–2.0)
Compulsory intramuscular injection is safe for the staff	IM_Safe_Staff	122	70	1–5	1 = strongly agree (10.0%) 2 = agree (38.6%) 3 = uncertain (17.1%) 4 = disagree (32.9%) 5 = strongly disagree (1.4%)	2.77 (1.07)	3.0 (2.0–4.0)

conduct this study was granted by all 22 healthcare organizations. Dr. Len Bowers made the ACMQ available for research. No personal data or patient-level data were collected. Completion of the questionnaire was voluntary and based on informed consent. The data were stored appropriately on a protected network drive, and all the identifiers were removed from the data. Only the researcher that performed the data collection had the access to data.

5 | RESULTS

A total of 109 wards in Finnish psychiatric inpatient care, representing one-third of all wards identified for the study, reported using seclusion in 2017. More specifically, they reported 4,006 seclusion episodes, which translated to 6.09 episodes per 1,000 hospital days.

Altogether, 93 nursing managers responded to the questionnaire; of these, 19 managers were excluded because they were not managers at wards that used restrictive measures during 2017. Additionally, four of the managers had worked in the current job for less than a year and were therefore excluded, enabling a more realistic analysis of the associations. In total, 70 of the respondents were eligible for this study, and as the number of nursing managers that work as supervisors on wards that apply restrictive measures is estimated to be about 250, the response rate in this study was 28%. The respondents worked as nursing managers on 82 different wards.

The final data set of seven independent variables and one target variable with discretization of the variable Age is presented in Table 1. The ANB model with the variable Number of seclusion episodes (Seclusion_Ep) as the target is presented in Figure 1. The variables Age, Compulsory intramuscular (IM) medication's safety for the staff (IM_Safe_Staff), Intermittent observation's effectiveness (Intobs_effect), and Seclusion's safety for the patient (Seclusion_Safe_Pt) showed the strongest total effect (consisting of the direct effect and an effect mediated by some other variable) on the target.
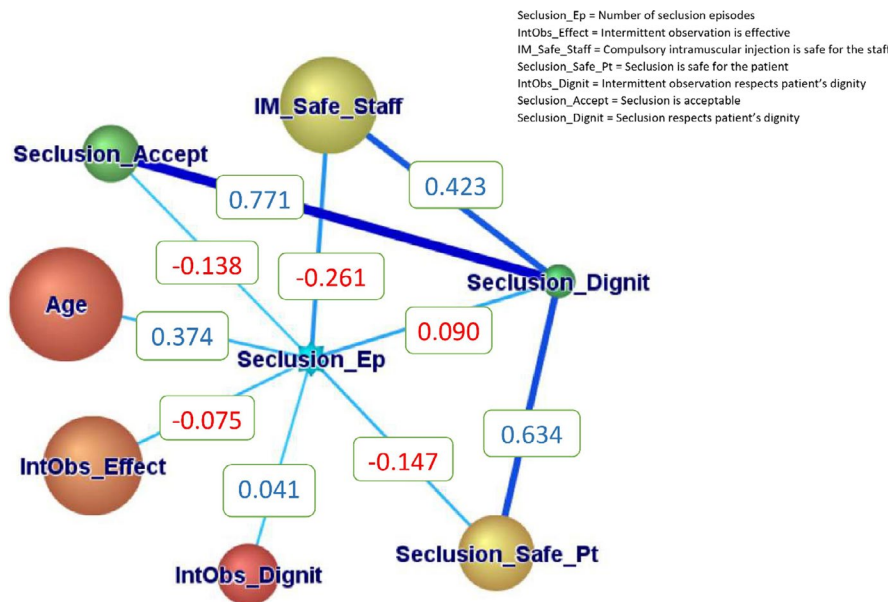
The variable concerning the Dignity of seclusion (Seclusion_Dignit) had a strong association with variables Seclusion_Accept and Seclusion_Safe_Pt.

The predictive performance of the model as an area under ROC Curve (AUC) was 96.6%. The predictive accuracy was 87.1% and $R^2 = .812$. The sensitivity of the model was 87.5%, specificity 86.4%, positive predictive value was 93.3%, and negative predictive value 76.0%. This result was controlled by resampling with data perturbation. The mean accuracy was 87.7%, AUC 94.2, and $R^2 = .58$. We used the Jackknife resampling method to measure the robustness of arcs. We used only arcs that were present in all networks obtained from the Jackknife resampling. We performed Jackknife resampling using ANB search with data perturbation. Arcs Seclusion_dignit→IM_Safe_Staff and Seclusion_dignit→Seclusion_Safe_Pt were present in 20% of subsets. However, we wanted to include these arcs due to their high Pearson correlation values. All other arcs were present in 100% of subsets.

The fixation table for the model is presented in Table 2. The results indicate that the variables Age (models 2–4), Safety of seclusion for the patient (Seclusion_Safe_Pt, model 14) and Acceptablity of seclusion (Seclusion_Accept, model 24) were most associated with the target. The remaining variables had only a minor effect on the outcome.

The target's posterior probabilities for outcome variable are presented in Figures 2 and 3. Local analyses of mutual information between the target variable and independent variables are presented in Table 3. These analyses show that Age, Effectiveness of intermittent observation (In_Obs_Effect), Compulsory intramuscular medication's safety for the staff (IM_Safe_Staff) and Safety of seclusion for the patient (Seclusion_Safe_Pt) have the most effect on the target variable.

Pearson correlation (Figure 1) indicates negative correlation between the number of seclusion episodes and effectiveness of intermittent observation ($r = -.075$), safety of seclusion for the

Seclusion_Ep = Number of seclusion episodes
IntObs_Effect = Intermittent observation is effective
IM_Safe_Staff = Compulsory intramuscular injection is safe for the staff
Seclusion_Safe_Pt = Seclusion is safe for the patient
IntObs_Dignit = Intermittent observation respects patient's dignity
Seclusion_Accept = Seclusion is acceptable
Seclusion_Dignit = Seclusion respects patient's dignity

FIGURE 1 The augmented naïve Bayes model of factors associated with the outcome variable Number of seclusion episodes. Nodes' sizes express each variables' mutual information with target node. Nodes' colours indicate direct effects on target, green being the highest and red lowest, yellow in between. Lines between nodes indicate Kullback–Leibler's divergence values between the manifest and latent variables, between them. Boxes in arcs indicate Pearson's correlation (blue = positive correlation, red = negative correlation)

TABLE 2 Fixation table demonstrating values of the outcome variable Number of seclusion episodes (Seclusion_Ep) when the model is fixed to selected values

Model number	Fixation	Values of the outcome variable Number of seclusion episodes (Seclusion_Ep)
1	No fixation	1 = 68.6% 2 = 31.2%
2	Age under 42 years = fixed to 100%	1 = 88.0% 2 = 12.0%
3	Age 42.5 years–51.5 years = fixed to 100%	1 = 69.6% 2 = 30.4%
4	Age 52 years or more = fixed to 100%	1 = 45.5% 2 = 54.5%
5	Intermittent observation is effective (IntObs_Effect) 1 = fixed to 100%	1 = 76.9% 2 = 23.1%
6	Intermittent observation is effective (IntObs_Effect) 2 = fixed to 100%	1 = 55.9% 2 = 44.1%
7	Intermittent observation is effective (IntObs_Effect) 3 = fixed to 100%	1 = 66.7% 2 = 33.3%
8	Intermittent observation is effective (IntObs_Effect) 4 = fixed to 100%	1 = 100% 2 = 0%
9	Compulsory intramuscular injection is safe for the staff (IM_Safe_Staff) 1 = fixed to 100%	1 = 71.4% 2 = 28.6%
10	Compulsory intramuscular injection is safe for the staff (IM_Safe_Staff) 2 = fixed to 100%	1 = 51.9% 2 = 48.1%
11	Compulsory intramuscular injection is safe for the staff (IM_Safe_Staff) 3 = fixed to 100%	1 = 66.7% 2 = 33.3%
12	Compulsory intramuscular injection is safe for the staff (IM_Safe_Staff) 4 = fixed to 100%	1 = 86.9% 2 = 13.1%
13	Compulsory intramuscular injection is safe for the staff (IM_Safe_Staff) 5 = fixed to 100%	1 = 100% 2 = 0%
14	Seclusion is safe for the patient (Seclusion_Safe_Pt) 1 = fixed to 100%	1 = 50.0% 2 = 50.0%
15	Seclusion is safe for the patient (Seclusion_Safe_Pt) 2 = fixed to 100%	1 = 71.0% 2 = 29.0%
16	Seclusion is safe for the patient (Seclusion_Safe_Pt) 3 = fixed to 100%	1 = 50.0% 2 = 50.0%
17	Seclusion is safe for the patient (Seclusion_Safe_Pt) 4 = fixed to 100%	1 = 83.3% 2 = 16.7%

(Continues)

TABLE 2 (Continued)

Model number	Fixation	Values of the outcome variable Number of seclusion episodes (Seclusion_Ep)
18	Seclusion is safe for the patient (Seclusion_Safe_Pt) 5 = fixed to 100%	1 = 100% 2 = 0%
19	Intermittent observation respects patient's dignity (IntObs_Dignit) 1 = fixed to 100%	1 = 65.8% 2 = 34.2%
20	Intermittent observation respects patient's dignity (IntObs_Dignit) 2 = fixed to 100%	1 = 78.3% 2 = 21.7%
21	Intermittent observation respects patient's dignity (IntObs_Dignit) 3 = fixed to 100%	1 = 50.0% 2 = 50.0%
22	Intermittent observation respects patient's dignity (IntObs_Dignit) 4 = fixed to 100%	1 = 75.0% 2 = 25.0%
23	Intermittent observation respects patient's dignity (IntObs_Dignit) 5 = fixed to 100%	1 = 0% 2 = 100%
24	Seclusion is acceptable (Seclusion_Accept) 1 = fixed to 100%	1 = 52.6% 2 = 47.4%
25	Seclusion is acceptable (Seclusion_Accept) 2 = fixed to 100%	1 = 75.9% 2 = 24.1%
26	Seclusion is acceptable (Seclusion_Accept) 3 = fixed to 100%	1 = 71.4% 2 = 28.6%
27	Seclusion is acceptable (Seclusion_Accept) 4 = fixed to 100%	1 = 71.4% 2 = 28.6%
28	Seclusion is acceptable (Seclusion_Accept) 5 = fixed to 100%	1 = 100% 2 = 0%
29	Seclusion respects patient's dignity (Seclusion_Dignit) 1 = fixed to 100%	1 = 77.8% 2 = 22.2%
30	Seclusion respects patient's dignity (Seclusion_Dignit) 2 = fixed to 100%	1 = 61.9% 2 = 38.1%
31	Seclusion respects patient's dignity (Seclusion_Dignit) 3 = fixed to 100%	1 = 66.7% 2 = 33.3%
32	Seclusion respects patient's dignity (Seclusion_Dignit) 4 = fixed to 100%	1 = 72.0% 2 = 28.0%
33	Seclusion respects patient's dignity (Seclusion_Dignit) 5 = fixed to 100%	1 = 66.7% 2 = 33.3%

Note: Model 1 shows results when the model is unfixed, Models 2–33 are done by fixing one separate value.

patient ($r = -.147$), dignity of seclusion ($r = -.090$), safety of IM medication for the staff ($r = -.261$) and acceptance of seclusion ($r = -.138$). A positive correlation occurs between the number of seclusion episodes and age ($r = .374$), and dignity of intermittent observation ($r = .041$). In addition, the correlation is positive between safety of IM medication for the staff and dignity of seclusion ($r = .423$), safety of seclusion for the patient and dignity of seclusion ($r = .634$), and acceptance of seclusion and dignity of seclusion ($r = .771$).

The independent variables have several effects on the target variable, and the associations are not necessarily linear (Figures 1 and 2). The number of seclusion episodes was higher as managers agreed or were uncertain if intermittent observation is effective, IM medication is safe for the staff, and seclusion is dignified. On the other hand, as managers strongly agreed or disagreed that intermittent observation is effective, the number of seclusion episodes was lower. On wards where managers strongly agreed, disagreed, or strongly disagreed IM medication being safe to the staff, the number of seclusion episodes was lower. In addition, on wards where managers strongly disagreed seclusion being dignified, the number of seclusion episodes was higher, and the number was lower as managers strongly agreed or disagreed seclusion being dignified.

The number of seclusion episodes was also higher as managers strongly agreed seclusion being safe for the patient or were uncertain of its safety, and strongly agreed that seclusion is acceptable. Likewise, the number of seclusion episodes was lower as managers disagreed or strongly disagreed seclusion being safe for the patient. However, the number of seclusion episodes was lower as managers agreed, were uncertain of, disagreed, or strongly disagreed that seclusion is acceptable. In addition, the number of seclusion episodes was higher as managers strongly agreed or strongly disagreed that intermittent observation is dignified or were uncertain of its dignity. As managers agreed or disagreed that intermittent observation was dignified, the number of seclusion episodes was lower.

On wards where managers were older than 51.4 years, the number of seclusion episodes was lower, and on wards where managers were aged 42.5 or younger, the number of seclusion episodes was higher.

6 | DISCUSSION

To our knowledge, this is the first study to examine the relationship between nursing managers' attitudes with the use of containment measures and the use of coercion. In this study, we chose to describe the use of coercion with the number of seclusion episodes because seclusion is the most used coercive measure in Finland and is reported conscientiously (Laukkanen, Kuosmanen, Selander, et al., 2020). Due to the complexity and the limited size of the data set, we used Bayesian network modelling to detect factors associated with seclusion practices. This is the first time that Bayesian network modelling has been used in this or related contexts.

It has been stated that attitudes influence the decisions taken by nurses to use seclusion in psychiatric care (Larue et al., 2009). In this study, psychiatric nursing managers' age, and variables concerning their perceptions on the efficacy of intermittent observation, safety of compulsory IM medication for the staff, and the safety of seclusion for the patient were in strongest association with the number of seclusion episodes. In addition, weaker associations were discovered between the number of seclusion episodes and managers' perceptions of acceptance of seclusion, dignity of seclusion, and dignity of intermittent observation.

Managers have an essential role in establishing and maintaining their organization's culture, as the behaviours, values, and attitudes of an institution begin with its leadership and diffuse through role modelling and communication (Kane-Urrabazo, 2006). In addition, as power dynamics have a potential effect on health care professionals' choices (McDonald et al., 2012) and patient outcomes (Viinikainen et al., 2015), nursing managers as authorities presumably have a significant role when nursing staff consider the use of seclusion.

Seclusion was used more often on wards with nursing managers who were older than the average. Interestingly, the previous study by Whittington et al. (2009) showed that younger staff were more likely to accept the utilization of containment methods than older staff, and the study by Doedens et al. (2017) did not find any association between nurses' age and the use of seclusion. Presumably, older managers have used seclusion and other coercive measures more regularly than their younger colleagues, and therefore are willing to encourage staff to make use of it. Van Doeselaar et al. (2008) study supports this theory concerning the use of seclusion and preparedness to use it. In addition, the treatment culture in psychiatric care, which is stated to influence the use of coercion (Husum et al., 2010), has changed over time.

Psychiatric nursing managers' attitudes towards seclusion were related to the use of seclusion. Seclusion was used more often on wards with nursing managers who considered seclusion as acceptable, safe for the patient, and dignified. This supports the basic presumption of attitudes being related to actions (Bowers et al. 2010; Fishbein & Ajzen, 1975), or in this case, it is presumable that nursing managers with positive attitudes towards seclusion more likely encourage nursing staff to use it. Bowers et al. (2007) suggest that staff are willing to use a containment method if they consider it as safe for the patients and effective. Possibly the attitudes affect even the managers' and staff's commitment to seclusion reduction programmes. As stated by van Doeselaar et al. (2008), managers often have a more negative view on the use of coercion than the nursing staff, because managers usually are not closely involved in its use.

Seclusion was used more often on wards where nursing managers considered intermittent observation as effective but not dignified. It is possible that managers encourage the staff to use other measures instead of intermittent observation, if it is not considered as a dignified, even though effective, method. In previous studies, nursing managers' attitudes towards intermittent observation seem to have been more positive than attitudes towards seclusion

P(Seclusion_Ep = 1 | ...)
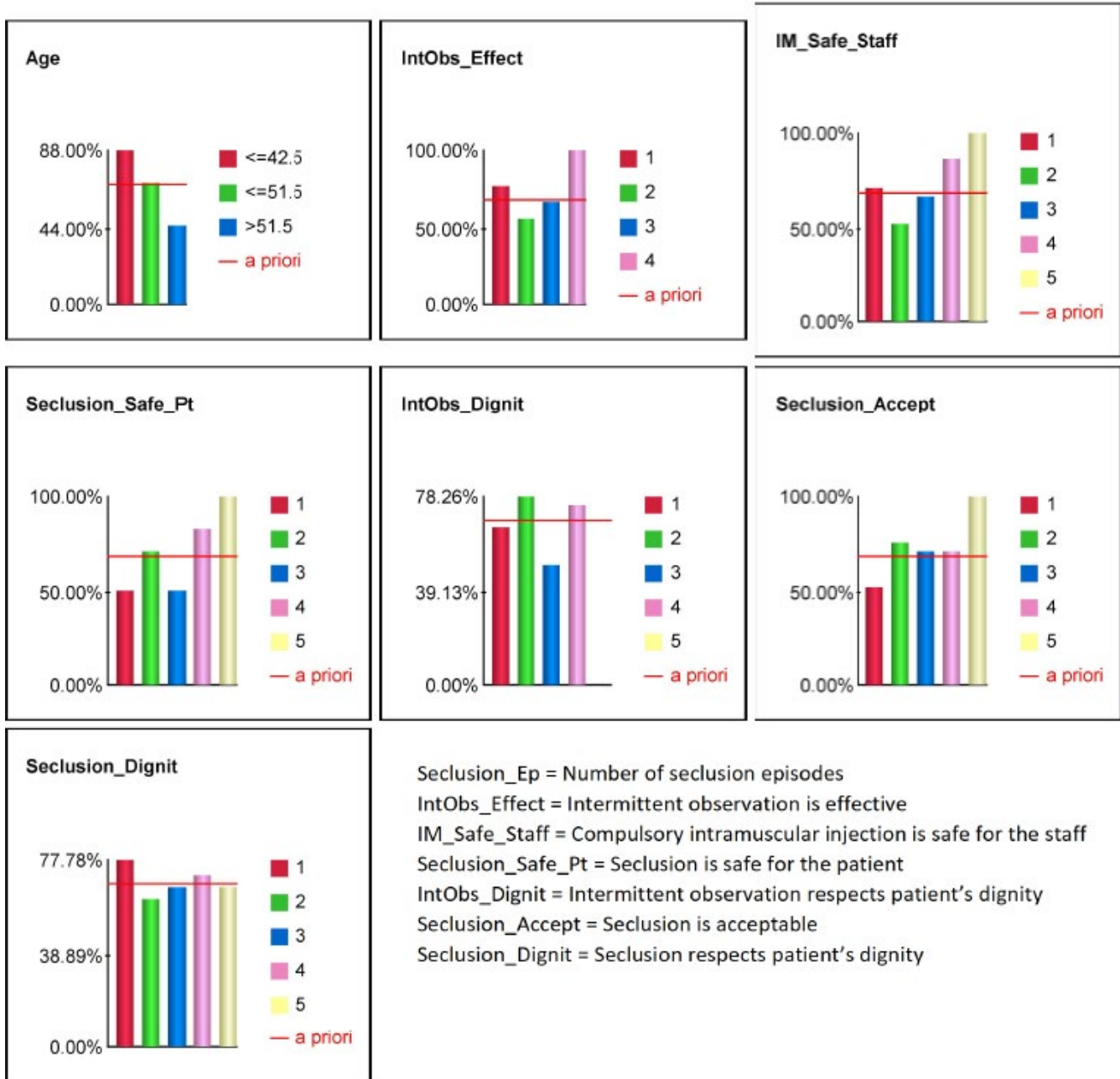
FIGURE 2 Target's posterior probabilities for outcome variable Number of seclusion episodes = 1. The red line indicates the prior value, and bars exceeding the line indicate variables' values having an effect on the target variable

(Laukkanen, Kuosmanen, Louheranta, et al., 2020), and nursing staff were found to consider intermittent observation as more acceptable than the use of seclusion (Bowers et al., 2007).

Wards where nursing managers had a more positive perception of the use of compulsory intramuscular (IM) medication saw more seclusion episodes. This is a consistent result, as seclusion and compulsory IM medication are often used alongside one another.

In the future, nursing managers' attitudes and managers' attitudes relationship with the use of seclusion or other restrictive measures should be examined more thoroughly. In addition, nursing managers' attitudes associations to nursing staff's attitudes should not be dismissed. In the upcoming studies, several possible confounding variables should be considered.

6.1 | Limitations

An important limitation in our study is the relatively small sample size. Therefore, we used only the training set without dividing the data set into training and test sets. However, we consider that this

P(Seclusion_Ep = 2 | ...)
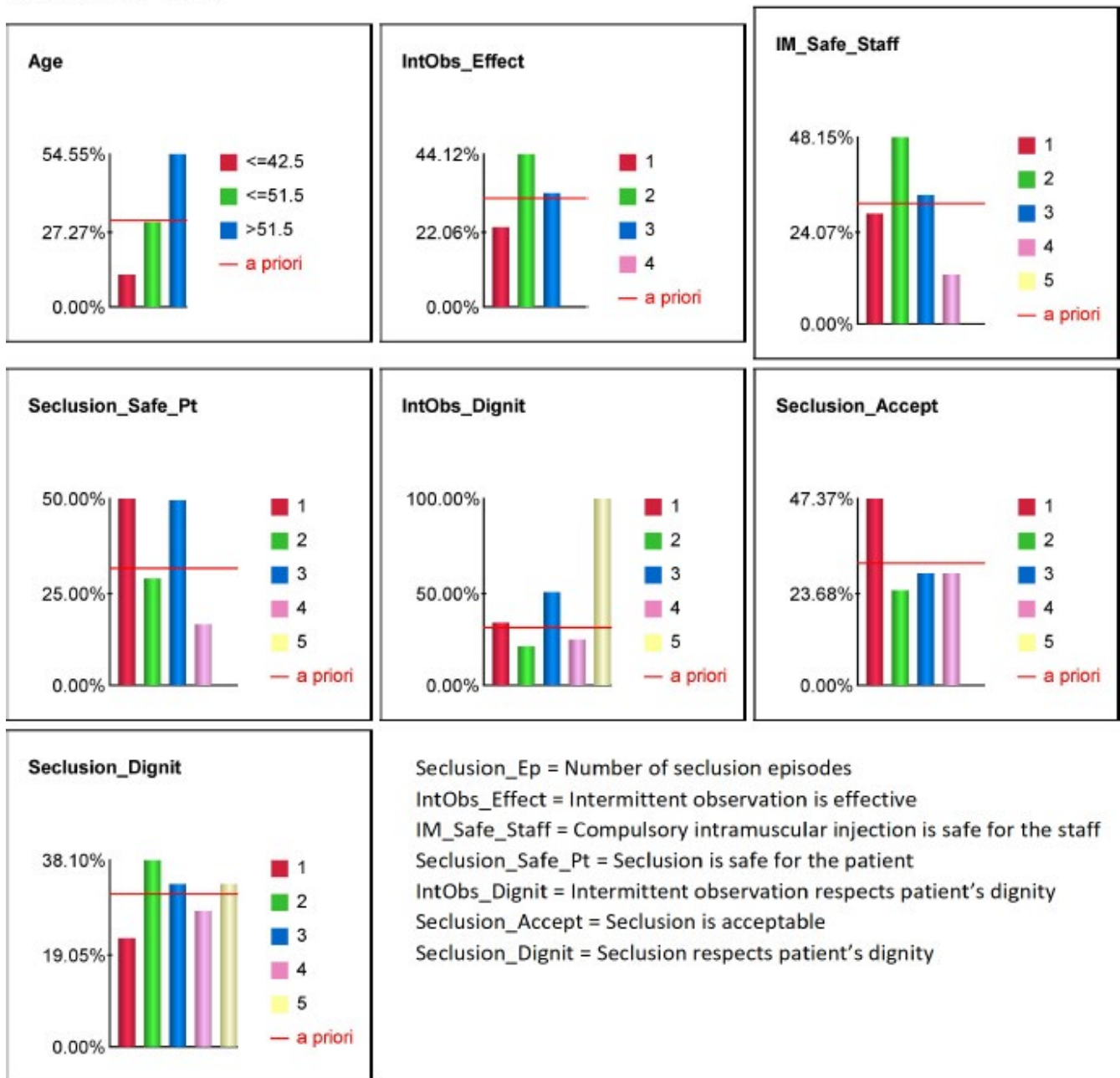
FIGURE 3 Target's posterior probabilities for outcome variable Number of seclusion episodes = 2. The red line indicates the prior value, and bars exceeding the line indicate variables' values having an effect on the target variable

is a suitable method to reach our goal of detecting factors associated with the target variable, i.e. the number of seclusion episodes. The Bayesian approach affords certain advantages over standard frequentist methods in analysing data collected in real practice. For example, Bayesian analysis can handle complicated and small data sets with missing data, outliers, and nonlinear relationships, and the results of the analysis can be presented in a visual form that is easy to interpret. In this study, Bayesian analysis gives a special advantage due to the ability to handle small data sets (Allmark, 2004; Darwiche, 2010; Sheingold, 2001; van de Schoot et al., ,2014, 2015;

Woertman & van der Wilt, 2013). We found the model stabile. We consider the produced model describes the Finnish situation well; naturally, our data are from Finland and cover only Finnish psychiatric institutions.

There are regional differences in the use of seclusion in Finland, which might have an effect on the results. However, these results represent 82 different wards and can therefore be considered as representative. The results of the study are also considered as geographically representative, because 17 out of 22 organizations across the country were involved. In addition, psychiatric care is

TABLE 3 Local analyses of mutual information between target variable and independent variables. The results are presented separately for both values of the target

Node	Binary mutual information	Max Bayes factor		Min Bayes factor	
Number of seclusion episodes (Seclusion_Ep) = 1 (68.6%)					
Age	0.1053	≤42.5 (1/3)	1.2833	>51.5 (3/3)	0.6629
Intermittent observation is effective (IntObs_Effect)	0.0884	4	1.4583	2	0.8150
Compulsory intramuscular injection is safe for the staff (IM_Safe_Staff)	0.0854	5	1.4583	2	0.7562
Seclusion is safe for the patient (Seclusion_Safe_Pt)	0.0603	5	1.4583	1	0.7292
Intermittent observation respects patient's dignity (IntObs_Dignit)	0.0432	2	1.1413	5	0.0000
Seclusion is acceptable (Seclusion_Accept)	0.0379	5	1.4583	1	0.7675
Seclusion respects patient's dignity (Seclusion_Dignit)	0.0099	1	1.1343	2	0.9028
Number of seclusion episodes (Seclusion_Ep) = 2 (31.4%)					
Age	0.1053	>51.5 (3/3)	1.7355	≤42.5 (1/3)	0.3818
Intermittent observation is effective (IntObs_Effect)	0.0884	2	1.4037	4	0.0000
Compulsory intramuscular injection is safe for the staff (IM_Safe_Staff)	0.0854	2	1.5320	5	0.0000
Seclusion is safe for the patient (Seclusion_Safe_Pt)	0.0603	1	1.5909	5	0.0000
Intermittent observation respects patient's dignity (IntObs_Dignit)	0.0432	5	3.1818	2	0.6917
Seclusion is acceptable (Seclusion_Accept)	0.0379	1	1.5072	5	0.0000
Seclusion respects patient's dignity (Seclusion_Dignit)	0.0099	2	1.2121	1	0.7071

organized in a similar way across the country, and despite potential regional differences in the treatment culture, the same legislation and regulations are applied in every Finnish organization. There are some differences in morbidity, but it is unclear whether these differences affect the care system. Based on the psychiatric inpatient nursing manager population, the required sample size would have been 152 (at 95% confidence interval level), but as the population was relatively small, we decided to send the questionnaire to all eligible managers. However, as the 90% power would have required substantially larger samples, concerning most of the variables, the results of this study needs to be interpreted with some caution. In addition, it is possible that nursing managers who were especially interested in the use of seclusion or its reduction might be overrepresented within the respondents, which might affect the results.

As there are a limitless number of variables that might affect the use of seclusion, it is possible that there are several intervening variables that were not observed in this study. For example, we did not collect data concerning patients, nursing staff or ward characteristics. It is possible that different wards have different kinds of patients or that there were significant variations in staffing between wards. However, as the number of possible intervening variables is somewhat uncontrollable, we had to make the decision to limit the

data collection to nursing managers and the actual use of seclusion. Moreover, we presented the number of seclusion episodes in relation to hospital days to transform the numbers into a more comparable form.

7 | CONCLUSION

Nursing managers' negative perceptions of seclusion are associated with less use of seclusion and thus might even result in a reduction in its use. However, nursing managers alone cannot lessen the use of seclusion, but they should be encouraged to guide their staff to reduce its use, and to support staff in providing quality psychiatric care.

Older nursing managers, probably with longer practical experience in using seclusion, presumably favour its implementation because of being accustomed to using it. A newer generation of managers might be more willing to accept the goal of minimizing the use of seclusion and other coercive measures. The negative influence of seclusion, as well as the use of alternative and less intrusive measures, should be considered as important topics in educating and training psychiatric nursing managers in the future.

8 | RELEVANCE STATEMENT

Seclusion is ego-dystonic for the patients, and thus, its use needs to be reduced. However, seclusion is used frequently in psychiatric care, despite its potentially harmful effects. Nurses have a crucial role in the reduction of seclusion, but there is an evident gap in research concerning nursing management and the use of seclusion. However, leadership and management are considered as key strategies in programmes aiming to reduce seclusion. In this study, the relationship between nursing managers' age and attitudes towards containment methods and the use of seclusion were investigated. The results provide complementary information to support the reduction of seclusion.

CONFLICT OF INTEREST

The authors declare that they have no relevant material or financial interests that relate to the research described in this paper.

AUTHOR CONTRIBUTIONS

All of the listed authors meet authorship criteria according to the latest guidelines of the International Committee of Medical Journal Editors, and all authors are in agreement with the submission of this manuscript.

ETHICAL APPROVAL

The University of Eastern Finland Committee on Research Ethics has given a supporting statement (2/2017) for this research.

DATA AVAILABILITY STATEMENT

Research data are not shared.

ORCID

Emilia Laukkanen [iD] https://orcid.org/0000-0001-7103-5786

REFERENCES

Act on Specialized Medical Care (1062/1989). *Ministry of Social Affairs and Health, Finland*. Retrieved from https://www.finlex.fi/en/laki/kaannokset/1989/en19891062

Aiken, L. H., Sloane, D., Griffiths, P., Rafferty, A. M., Bruyneel, L., McHugh, M., Maier, C. B., Moreno-Casbas, T., Ball, J. E., Ausserhofer, D., & Sermeus, W., & RN4CAST Consortium (2017). Nursing skill mix in European hospitals: Cross-sectional study of the association with mortality, patient ratings, and quality of care. *BMJ Quality & Safety*, 26(7), 559–568. https://doi.org/10.1136/bmjqs-2016-005567

Allmark, P. (2004). Bayes and health care research. *Medicine, Health Care and Philosophy*, 7, 321–332. https://doi.org/10.1007/s11019-004-0804-4

American Psychiatric Nurses Association (2014). *APNA Position on the Use of Seclusion & Restraint*. Retrieved from https://www.apna.org/i4a/pages/index.cfm?pageid=3730#Standards

Bak, J., & Aggernæs, H. (2012). Coercion within Danish psychiatry compared with 10 other European countries. *Nordic Journal of Psychiatry*, 66, 297–302. https://doi.org/10.3109/08039488.2011.632645

Bowers, L. (2006). On conflict, containment and the relationship between them. *Nursing Inquiry*, 13, 172–180. https://doi.org/10.1111/j.1440-1800.2006.00319.x

Bowers, L., Alexander, J., Simpson, A., Ryan, C., & Carr-Walker, P. (2004). Cultures of psychiatry and the professional socialization process: The case of containment methods for disturbed patients. *Nurse Education Today*, 24, 435–442. https://doi.org/10.1016/j.nedt.2004.04.008

Bowers, L., Van Der Merwe, M., Nijman, H., Hamilton, B., Noorthorn, E., Stewart, D., & Muir-Cochrane, E. (2010). The practice of seclusion and time-out on English acute psychiatric wards: The City-128 study. *Archives of Psychiatric Nursing*, 24, 275–286. https://doi.org/10.1016/j.apnu.2009.09.003

Bowers, L., van der Werf, B., Vokkolainen, A., Muir-Cochrane, E., Allan, T., & Alexander, J. (2007). International variation in containment measures for disturbed psychiatric inpatients: A comparative questionnaire survey. *International Journal of Nursing Studies*, 44, 357–364. https://doi.org/10.1016/j.ijnurstu.2006.01.005

Conrady, L., & Jouffe, L. (2015). *Bayesian networks and BayesiaLab – A practical introduction for researchers*. Bayesia USA.

Dack, C., Ross, J., & Bowers, L. (2012). The relationship between attitudes towards different containment measures and their usage in a national sample of psychiatric inpatients. *Journal of Psychiatric and Mental Health Nursing*, 19, 577–586. https://doi.org/10.1111/j.1365-2850.2011.01832.x

Darwiche, A. (2010). Bayesian networks. *Communications of the ACM*, 53, 80–90. https://doi.org/10.1145/1859204.1859227

Doedens, P., Maaskant, J. M., Latour, C. H. M., van Meijel, B. K. G., Koeter, M. W. J., Storosum, J. G., Barkhof, E., & de Haan, L. (2017). Nursing staff factors contributing to seclusion in acute mental health care – An explorative cohort study. *Issues in Mental Health Nursing*, 38, 584–589. https://doi.org/10.1080/01612840.2017.1297513

Donat, D. C. (2003). An analysis of successful efforts to reduce the use of seclusion and restraint at a public psychiatric hospital. *Psychiatric Services*, 54, 1119–1123. https://doi.org/10.1176/appi.ps.54.8.1119

Erwin, P. (2001). *Attitudes and Persuasion*. Psychology Press.

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Addison-Wesley.

Goulet, M. H., Larue, C., & Lemieux, A. J. (2018). A pilot study of "post-seclusion and/or restraint review" intervention with patients and staff in a mental health setting. *Perspectives of Psychiatric Care*, 54, 212–220. https://doi.org/10.1111/ppc.12225

Happell, B., & Harrow, A. (2010). Nurses' attitudes to the use of seclusion: A review of the literature. *International Journal of Mental Health Nursing*, 19, 162–168. https://doi.org/10.1111/j.1447-0349.2010.00669.x

Happell, B., & Koehn, S. (2011). Seclusion as a necessary intervention: The relationship between burnout, job satisfaction and therapeutic optimism and justification for the use of seclusion. *Journal of Advanced Nursing*, 67, 1222–1231. https://doi.org/10.1111/j.1365-2648.2010.05570.x

Hottinen, A., Välimäki, M., Sailas, E., Putkonen, H., Joffe, G., Noda, T., & Lindberg, N. (2012). Attitudes towards different containment measures: A questionnaire survey in Finnish adolescent psychiatry. *Journal of Psychiatric and Mental Health Nursing*, 19, 521–527. https://doi.org/10.1111/j.1365-2850.2011.01820.x

Huckshorn, K. A. (2004). Reducing Seclusion & Restraint Use in Mental Health Settings - Core Strategies for Prevention. *Journal of Psychosocial Nursing and Mental Health Services*, 42(9), 22–33. https://doi.org/10.3928/02793695-20141006-01

Huckshorn, K. A. (2014). Reducing seclusion & restraint use in inpatient settings a phenomenological study of state psychiatric hospital leader and staff experiences. *Journal of Psychosocial Nursing and*

Mental Health Services, *52*, 40–47. https://doi.org/10.3928/02793695-20141006-01

Husum, T. L., Bjørngaard, J. H., Finset, A., & Ruud, T. (2010). A cross-sectional prospective study of seclusion, restraint and involuntary medication in acute psychiatric wards: Patient, staff and ward characteristics. *BMC Health Services Research*, *10*, 89. https://doi.org/10.1186/1472-6963-10-89

Jalil, R., Huber, J. W., Sixsmith, J., & Dickens, G. L. (2017). Mental health nurses' emotions, exposure to patient aggression, attitudes to and use of coercive measures: Cross sectional questionnaire survey. *International Journal of Nursing Studies*, *75*, 130–138. https://doi.org/10.1016/j.ijnurstu.2017.07.018

Janssen, W. A., van de Sande, R., Noorthoorn, E. O., Nijman, H. L. I., Bowers, L., Mulder, C. L., Smit, A., Widdershoven, G. A., & Steinert, T. (2011). Methodological issues in monitoring the use of coercive measures. *International Journal of Law and Psychiatry*, *34*, 429–438. https://doi.org/10.1016/j.ijlp.2011.10.008

Kane-Urrabazo, C. (2006). Management's role in shaping organizational culture. *Journal of Nursing Management*, *14*, 188–194. https://doi.org/10.1111/j.1365-2934.2006.00590.x

Kass, R. E., & Raftery, A. E. (1995). Bayes Factors. *Journal of the American Statistical Association*, *90*, 773–795. https://doi.org/10.1080/01621459.1995.10476572

Kekolahti, P. (2019). *Bayesian Network Analysis of Mobile Service and Device Usage*. Aalto University publication series. Doctoral dissertations 201/2019. Helsinki.

Larue, C., Dumais, A., Ahern, E., Bernheim, E., & Mailhot, M.-P. (2009). Factors influencing decisions on seclusion and restraint. *Journal of Psychiatric and Mental Health Nursing*, *16*, 440–446. https://doi.org/10.1111/j.1365-2850.2009.01396.x

Laukkanen, E., Kuosmanen, L., Louheranta, O., & Vehviläinen-Julkunen, K. (2020). Psychiatric nursing managers' attitudes towards containment methods in psychiatric inpatient care. *Journal of Nursing Management*, *28*, 699–709. https://doi.org/10.1111/jonm.12986

Laukkanen, E., Kuosmanen, L., Selander, T., & Vehviläinen-Julkunen, K. (2020). Seclusion, restraint, and involuntary medication in Finnish psychiatric care: A register study with root-level data. *Nordic Journal of Psychiatry*, *74*, 439–443. https://doi.org/10.1080/08039488.2020.1733658

Laukkanen, E., Vehviläinen-Julkunen, K., Louheranta, O., & Kuosmanen, L. (2019). Psychiatric nursing staffs' attitudes towards the use of containment methods in psychiatric inpatient care: An integrative review. *International Journal of Mental Health Nursing*, *28*, 390–406. https://doi.org/10.1111/inm.12574

Lay, B., Nordt, C., & Rössler, W. (2011). Variation in use of coercive measures in psychiatric hospitals. *European Psychiatry*, *26*, 244–251. https://doi.org/10.1016/j.eurpsy.2010.11.007

Luciano, M., Sampogna, G., Del Vecchio, V., Pingani, L., Palumbo, C., De Rosa, C., Catapano, F., & Fiorillo, A. (2014). Use of coercive measures in mental health practice and its impact on outcome: A critical review. *Expert Review of Neurotherapeutics*, *14*, 131–141. https://doi.org/10.1586/14737175.2014.874286

Mahmoud, A. S. (2017). Psychiatric nurses' attitude and practice toward physical restraint. *Archives of Psychiatric Nursing*, *31*, 2–7. https://doi.org/10.1016/j.apnu.2016.07.013

Martikainen, V., & Järvelin, J. (2019). *Psychiatric specialist medical care 2018. Statistical Report 42/2019*. National Institute of Health and Welfare. [Cited 2 May 2020]. http://urn.fi/URN:NBN:fi-fe2019112243879

McDonald, J., Jayasuriya, R., & Harris, M. F. (2012). The influence of power dynamics and trust on multidisciplinary collaboration: A qualitative case study of type 2 diabetes mellitus. *BMC Health Services Research*, *12*, 63. https://doi.org/10.1186/1472-6963-12-63

McLaughlin, P., Giacco, D., & Priebe, S. (2016). Use of coercive measures during involuntary psychiatric admission and treatment outcomes: Data from a prospective study across 10 European Countries. *PLoS One*, *11*, e0168720. https://doi.org/10.1371/journal.pone.0168720

Mental Health Act (1116/1990). *Ministry of Social Affairs and Health, Finland*. [Cited 27 May 2019]. Retrieved from www.finlex.fi/fi/laki/kaannokset/1990/en19901116.pdf

Ministry of Social Affairs and Health (2009). *Plan for Mental Health and Substance Abuse Work. Proposals of the Mieli 2009 Working Group to Develop Mental Health and Substance Abuse Work until 2015. Reports of the Ministry of Social Affairs and Health, 2009:3*. Ministry of Social Affairs and Health. [Cited 27 May 2019]. http://urn.fi/URN:ISBN:978-952-00-2768-1

Molewijk, B., Kok, A., Husum, T., Pedersen, R., & Aasland, O. (2017). Staff's normative attitudes towards coercion: The role of moral doubt and professional context— a cross-sectional survey study. *BMC Medical Ethics*, *18*, 37. https://doi.org/10.1186/s12910-017-0190-0

Pearl, J., & Mackenzie, D. (2018). *The Book of Why: The New Science of Cause and Effect*. Basic Books.

Pitkaaho, T., Partanen, P., Miettinen, M., & Vehviläinen-Julkunen, K. (2015). Non-linear relationships between nurse staffing and patients' length of stay in acute care units: Bayesian dependence modelling. *Journal of Advanced Nursing*, *71*, 458–473. https://doi.org/10.1111/jan.12550

Price, O., Baker, J., Bee, P., Grundy, A., Scott, A., Butler, D., Cree, L., & Lovell, K. (2017). Patient perspectives on barriers and enablers to the use and effectiveness of de-escalation techniques for the management of violence and aggression in mental health settings. *Journal of Advanced Nursing*, *2017*, 1–12. https://doi.org/10.1111/jan.13488

Rainio, J., & Räty, T. (2015). *Psychiatric specialist medical care 2013. Official Statistics of Finland. Statistical Report 2/2015*. National Institute of Health and Welfare. [Cited 27 May 2019]. http://urn.fi/URN:NBN:fi-fe201503191963

Ryynänen, O.-P., Leppänen, T., Kekolahti, P., Mervaala, E., & Töyräs, J. (2018). Bayesian network model to evaluate the effectiveness of continuous positive airway pressure in treatment of sleep apnea. *Healthcare Informatics Research*, *24*, 346–358.

Sheingold, S. H. (2001). Can Bayesian methods make data and analyses more relevant to decision makers? A perspective from Medicare. *International Journal of Technology Assessment in Health Care*, *17*, 114–122. https://doi.org/10.1017/s0266462301104101

Steinert, T., Lepping, P., Bernhardsgrütter, R., Conca, A., Hatling, T., Janssen, W., Keski-Valkama, A., Mayoral, F., & Whittington, R. (2010). Incidence of seclusion and restraint in psychiatric hospitals: A literature review and survey of international trends. *Social Psychiatry and Psychiatric Epidemiology*, *45*, 889–897. https://doi.org/10.1007/s00127-009-0132-3

Thomsen, C., Starkopf, L., Hastrup, L., Andersen, P., Nordentoft, M., & Benros, M. (2017). Risk factors of coercion among psychiatric inpatients: A nationwide register-based cohort study. *Social Psychiatry and Psychiatric Epidemiology*, *52*, 979–987. https://doi.org/10.1007/s00127-017-1363-3

Vainio, S., Järvelin, J., Kääriäinen, S., & Passoja, S. (2018). *Psychiatric specialist medical care 2017. Official Statistics of Finland. Statistical Report 33/2018*. National Institute of Health and Welfare. [Cited 27 May 2019]. http://urn.fi/URN:NBN:fi-fe2018101037957

Van de Schoot, R., Broere, J. J., Perryck, K. H., Zondervan-Zwijnenburg, M., & van Loey, N. E. (2015). Analyzing small data sets using Bayesian estimation: The case of posttraumatic stress symptoms following mechanical ventilation in burn survivors. *European Journal of Psychotraumatology*, *11*, 25216. https://doi.org/10.3402/ejpt.v6.25216

Van de Schoot, R., Kaplan, D., Denissen, J., Asendorpf, J. B., Neyer, F. J., & van Aken, M. A. G. (2014). A gentle introduction to Bayesian analysis: Applications to developmental research. *Child Development*, *85*, 842–860. https://doi.org/10.1111/cdev.12169

Van Doeselaar, M., Sleegers, P., & Hutschemaekers, G. (2008). Professionals' attitudes toward reducing restraint: the case of seclusion in The Netherlands. *Psychiatric Quarterly*, *79*, 97–109. https://doi.org/10.1007/s11126-007-9063-x

Viinikainen, S., Asikainen, P., Sieloff, C., Helminen, M., & Suominen, T. (2015). Is the first-line nursing managers' power congruent with that of the nursing group? *Nordic Journal of Nursing Research*, *35*, 3–9. https://doi.org/10.1177/0107408314560324

Whittington, R., Bowers, L., Nolan, P., Simpson, A., & Neil, L. (2009). Approval ratings of inpatient coercive interventions in a national sample of mental health service users and staff in England. *Psychiatric Services*, *60*, 792–798. https://doi.org/10.1176/ps.2009.60.6.792

Woertman, W., & van der Wilt, G. J. (2013). Estimating the effectiveness of HPV vaccination in the open population: A Bayesian approach. *Value in Health*, *16*, 604–609. https://doi.org/10.1016/j.jval.2013.01.001

Wong, C., Cummings, G., & Ducharme, L. (2013). The relationship between nursing leadership and patient outcomes: A systematic review update. *Journal of Nursing Management*, *21*, 709–724. https://doi.org/10.1111/jonm.12116

Wong, C. A., Elliott-Miller, P., Laschinger, H., Cuddihy, M., Meyer, R. M., Keatings, M., Burnett, C., & Szudy, N. (2015). Examining the relationships between span of control and manager job and unit performance outcomes. *Journal of Nursing Management*, *23*, 156–168. https://doi.org/10.1111/jonm.12107