


BMJ Open Measuring perception of mental well-being in patients under isolation precautions: a prospective comparative study

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ABSTRACT

Objectives Isolation precautions (IP) are applied to prevent transmission of pathogens in healthcare settings. Potential negative health outcomes experienced by patients have been previously described but results remain conflicting. We aimed at evaluating the psychological impact of IP in adult patients in isolation using a novel psychological assessment tool.

Study design Prospective matched cohort study.

Setting Tertiary care centre in Switzerland.

Participants Hospitalised patients under IP and non-isolated patients were matched by ward, age and illness severity.

Outcome measures We measured surrogates of mental and social well-being by using the Pictorial Representation of Illness and Self Measure (PRISM) instrument once during hospitalisation. PRISM is a visual psychometric instrument that has been validated as a quantitative measure of suffering. Smaller distance in self-to-illness separation (SIS) signifies higher importance for a patient.

Results 156 patients agreed to participate of which 63 were under IP and 93 were matched controls. Median (IQR) duration of isolation was 5 days (2–10). The median SIS (IQR) for perceived inferior nurses' care was 22.8 (18.5–24.3) and 23.8 (23.3–25.5) for isolated and non-isolated patients, respectively ($p < 0.001$). Similarly, median SIS (IQR) was significantly smaller in isolated than non-isolated patients for avoidance by visitors with 17.5 (7.7–22.0) and 22.2 (21.8–22.6), for loneliness with 7.5 (3.6–16.0) and 18 (10.2–21.6) and for feeling impure with 19 (17.0–21.5) and 21.5 (18.9–22.1), respectively (all p values < 0.05).

Conclusions IP to prevent transmission of pathogens may negatively impact mental and social well-being. Measures to alleviate adverse effects of IP should be taken routinely.

INTRODUCTION

The Centers for Disease Control and Prevention (CDC) recommends isolation precautions (IP) to prevent transmission of pathogens in healthcare settings, preferably by placing the patient in a single room. Multidrug-resistant organisms (MDRO) are the most common indication for IP in non-pandemic times.¹ According to the

Strengths and limitations of this study

- We applied a visual tool to evaluate the potential adverse effects of isolation precautions.
- The continuous measurement scale enabled more accurate and precise answers than with other psychological assessment tools.
- All analyses were adjusted for the most common confounding factors including underlying mental illness.
- Compliance with infection control standards was not formally assessed.
- The generalisability of the results may be limited.

Healthcare Infection Control Practices Advisory Committee (HICPAC) and the European Society for Clinical Microbiology and Infectious Diseases (ESCMID) patients infected or colonised with transmissible pathogens should preferably be placed into a single room and medical staff is required to wear gloves, gowns and facial masks on entry into the room for the duration of disease or the entire hospital stay, depending on the causative agent.^{1,2} In addition, visiting patients may be restricted, or hampered by the circumstance, that next kin also must wear personal protective equipment. Despite the fact that these measures can effectively limit the spread of MDRO³ and even stop epidemics such as SARS-CoV-1 (potentially eliminated) and SARS-CoV-2 (strong impact on transmission by limiting the freedom of moving).⁴ Such policies can potentially be harmful for in terms of psychological constraints and result in higher costs.⁵ Results from mainly observational studies indicate that medical personnel is reluctant to enter the room of patients in IP resulting in fewer monitoring of vital signs and omitted medical progress notes.⁶ Others have measured higher mean scores for depression and anxiety and lower scores for self-esteem

in isolated compared with non-isolated patients.^{7,8} Therefore, some institutions abandoned IP for specific MDRO balancing risk for transmission and potential harm for the patient.^{9,10}

It has been criticised that many of the studies assessing adverse events from IP have not been adequately controlled for illness-severity and were of small sample size.¹¹ Furthermore, most of the studies looked at the impact of long-term isolation, which nowadays is a rare situation in the acute care setting. Shorter isolation tends to have less impact on various health outcomes including patient satisfaction, medical encounter and depression.^{12–15} However, these data seem to be more conflicting and less generalisable. We therefore aimed to quantify the impact of IP on perception of psychological strain in acute care patients colonised or infected with transmissible pathogens, especially MDROs, and various degrees of comorbidities using a standardised approach borrowed from psychology research.¹⁶ These results may serve as basis for interventions to alleviate psychological side effects for patients in IP.

PATIENTS AND METHODS

The Basel University Hospital is an 800-bed tertiary care hospital in the northwestern part of Switzerland, with approximately 38 000 admissions/year. For 1 year, we prospectively measured the effects on mental well-being in patients under IP and concurrently with patients not being placed under IP as part of a quality assurance programme. All consecutive patients in IP in single rooms either in contact, droplet or aerosol isolation for a minimum of 24 hours, and with appropriate language skills were invited to participate in the study. The infection control policy in our hospital follows the IP measures recommended by HICPAC and ESCMID.^{1,2} We obtained written informed consent from the study participant or next kin.

The following parameters were obtained from the electronic medical record: Age, sex, McCabe score and psychiatric disorder as indicated in the diagnosis list on admission. For every study participant in isolation we asked two non-isolated patients matched by ward, McCabe score¹⁷ and age range (≤ 40 years, 41–50 years, 51–60 years, 61–70 years and >70 years). Matching by ward ensured that the two cohorts were treated by the same medical staff. Since we were unsure how severity of illness might affect our results, we wanted to control for it by matching patients by this factor using the McCabe score.

The Pictorial Representation of Illness and Self Measure (PRISM) was applied to measure psychological and emotional impact of isolation. PRISM is a visual psychometric instrument that has been validated as a quantitative measure of suffering.¹⁶ On a white magnetic board that represents the life of an individual, a yellow disk (7 cm diameter) at the bottom right hand corner reflects the patients' personage or 'self' (figure 1). The

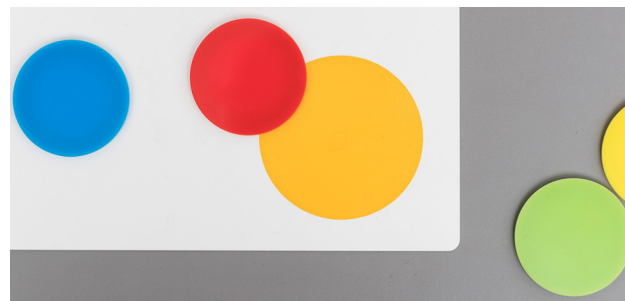


Figure 1 Pictorial Representation of Illness and Self Measure (PRISM). A white A4-sized metal board with a yellow circle representing the patient's 'self' is laid on a table. Coloured disks reflecting 'illness' are placed onto the board by the patient. Image provided by Prismium GmbH, Zurich, Switzerland (Prismium.ch).

patients are then prompted to put a second differently coloured disk with a smaller diameter representing their illness or condition on the board with the instruction that the placement should reflect the importance of this condition in their lives at this moment. The quantitative outcome measure derived from PRISM is the self-to-illness separation (SIS) which represents a patient's perception on how a condition is intruding in his or her life. The distance between the centres of the 'illness' and the 'self' disks can range from 0 to 27 cm with higher distances reflecting less suffering (figure 2).¹⁶

PRISM has been widely applied in patients suffering from various chronic conditions, for example, trauma or cancer and it shows consistently significant negative correlation of the SIS with depression, pain and disease-specific or generic measures of health-related quality of life.¹⁸ The conditions of interest in our study included loneliness, worry to jeopardise somebody's health, feelings of severe illness or bacterial contamination, inferior care by medical staff and avoidance by visitors. We further interrogated the patients on the importance of isolation measures. We addressed the same questions to the control patients, except for the last item: Instead of inquiring about the importance of isolation measures, we asked non-isolated patients to estimate the importance they attributed to overall hygiene measures. The disk and corresponding question were randomly chosen by the patient. The patient was asked where he would put the perceived 'illness' in his or her life at the moment and to place the disk accordingly. The SIS was measured for every condition separately. Each patient completed the PRISM tool once during the hospital stay.

Statistical analyses

We used descriptive statistics to express medians and proportions. We ran McNemar's test to compare categorical and ordinal data and the Wilcoxon signed-rank test for continuous non-normally distributed data, respectively. To check for normal distribution of the data we inspected the normal Q–Q plots and applied the Shapiro-Wilk test. We performed linear mixed models for each individual interrogated perception of mental well-being

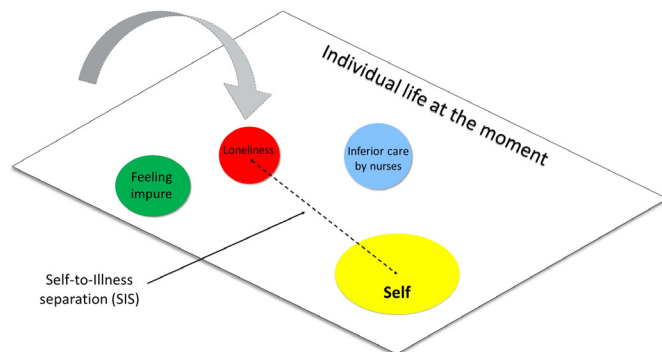


Figure 2 Self-to-illness separation (SIS), a quantitative outcome measure derived from Pictorial Representation of Illness and Self Measure. For each condition patients are asked ‘Where would you put the illness in your life at this moment?’ The SIS is the distance measured between the centres of the yellow circle and the coloured disks.

as dependent variable with contact isolation as independent binary predictor. We predefined to adjust all models for the most important predictors that we considered to have a potential impact, regardless of whether the two groups differed significantly on these characteristics. We treated age, sex, McCabe score and psychiatric disorder as fixed effects and ward as a random effect. Because we examined multiple endpoints, we divided the alpha level of 0.05 by the number of tests performed and considered the Bonferroni-corrected alpha level of <math><0.006</math> to be statistically significant. All statistical analyses were performed using IBM SPSS for Windows V.23.0.¹⁹

Patient and public involvement

Neither patients nor the public were involved in the design and conduct of the study. However, the authors

of the study carefully weighed the benefits for patients and the public against the possible disadvantages and concluded that the conduct of this study would also be of great interest from the perspective of patients and the public.

RESULTS

Participants' characteristics

Between November 2011 and August 2012, we approached 90 patients in IP. Of these, 27 (30%) were excluded from the study due to language barriers, study denial, lack of cooperation or the presence of a severe psychiatric disorder unable to complete the PRISM test. Full data from 63 patients were available for analyses matched with 93 (98%) of 95 eligible non-isolated patients as controls. There were no statistically significant differences with regard to age, sex and McCabe score between isolated and non-isolated study participants (table 1).

There was, however, a significantly higher proportion with a psychiatric disorder (depression or anxiety) in the non-isolated group compared with the patient cohort under IP (24.7% vs 4.8%, $p<0.001$). The participants stayed in IP for the following reasons: carriage of Extended-Spectrum-Beta-Lactamase producing (*ESBL*) *Escherichia coli* ($n=33$), non-*E. coli* *ESBL* (*K. pneumoniae*: $n=11$; *E. cloacae*: $n=3$), or methicillin-resistant *Staphylococcus aureus* (MRSA) ($n=6$), respectively, or infection with hypervirulent types of *Clostridioides difficile* ($n=4$)²⁰ or multi-drug resistant gram-negative bacteria not otherwise specified ($n=1$), and for viral infections ($n=1$), respectively. The median duration of isolation was 5 days (IQR: 2–10 days).

Table 1 Baseline characteristics of isolated and non-isolated (controls) patients

	Isolated patients (n=63)	Controls (n=93)	P value*
Age, median (IQR), years	68 (57–76)	67 (60–75)	0.65†
Female sex, number (%)	35 (55.6)	44 (47.1)	0.25‡
History of prior psychiatric disorder, number (%)	3 (4.8)	23 (24.7)	<0.001‡
McCabe score, median (IQR)	3 (2–3)	3 (2–3)	0.11†
No. patients with McCabe 1 (%)	6 (9.5)	4 (4.3)	
No. patients with McCabe 2 (%)	21 (33.3)	31 (33.3)	0.29‡
No. patients with McCabe 3 (%)	36 (57.1)	58 (62.4)	
Medical ward, number (%)	39 (61.9)	50 (53.8)	0.313‡
Surgical ward, number (%)	24 (38.1)	43 (46.2)	
Single bedroom, number (%)	59 (94.0)	0 (0.0)	
Duration of isolation, median (IQR), days	5 (2–10)	n.a.	
No. patients in contact isolation (%)	58 (92)	n.a.	
No. patients in contact and/or droplet isolation (%)	3 (5)	n.a.	
No. patients in aerosol isolation (%)	2 (3)	n.a.	

*Wilcoxon ranked-sign test.

†McNemar's test.

‡Tests were used to compare non-parametric continuous and categorical data, respectively, in dependent samples.

Impact of isolation as evaluated by PRISM

Compared with non-isolated patients, patients in IP reported a significantly higher degree of psychological strain and expressed a significantly stronger perception that nurses (but not doctors) did not care at a level they expected. The SIS (median, IQR) for ‘nurses’ care is inferior’ was statistically significantly smaller in isolated (22.8, 18.5–24.3) than in non-isolated patients (23.9, 23.3–25.5, $p < 0.001$), whereas the median SIS (IQR) for ‘doctors’ care is inferior’ was 24.5 (23.0–25.3) and 25.3 (23.5–26.0) in isolated and non-isolated patients, respectively ($p = 0.525$). Avoidance by visitors was significantly stronger perceived in isolated patients than in controls for a median SIS (IQR) of 17.5 (7.7–22.0) and 22.2 (21.8–22.6), respectively ($p < 0.001$). In addition, the median SIS (IQR) for boredom and loneliness was significantly more common in isolated patients (7.5; 3.6–16.0) compared with matched controls (18.0; 10.2–21.6) ($p < 0.001$). SIS medians (IQR) for ‘being a threat to others’ were 19.8 (16.0–21.6) and 20.1 (18.2–21.6) for patients in isolation and their matched controls, respectively; this difference was not statistically significant ($p = 1.000$). Similarly, the SIS medians (IQR) for perceived ‘illness severity’ were not statistically significantly different with 17.0 (10.1–20.0) versus 15.4 (9.75–18.95) in isolated versus non-isolated patients, respectively ($p = 0.801$). However, compared with non-isolated patients the feeling of impurity was more strongly perceived in isolated patients (median SIS 19, IQR 17.0–21.5) compared with controls (median SIS 21.5, IQR 18.9–22.1; $p = 0.012$). Both, patients under IP and their matched controls, attributed high importance to isolation and precaution measures and general infection control standards, respectively. The perception in non-isolated patients, however, was even significantly stronger than in isolated patients with a median SIS (IQR) of 3.6 (3.25–3.9) as compared with 4.0 (3.5–9.0), respectively ($p < 0.001$) (figure 3A–H).

When applying the linear mixed models controlling for age, sex, McCabe score, psychiatric disorders and ward the SIS significantly decreased for patients under isolation precautions for perceived inferior care by nurses (−3.0, 95% CI −4.4 to −1.6), avoidance by visitors (−6.8, 95% CI −8.3 to −5.2) and for feeling bored and lonely (−6.7, 95% CI −8.8 to −4.5), while the SIS significantly increased for importance of infection control standards (3.4, 95% CI 2.2 to 4.7) as compared with non-isolated patients. Care by doctors and feeling of impurity were also perceived as inferior in isolated patients, the difference, however, was not statistically significant (table 2).

DISCUSSION

It is part of the art of medicine to balance the risk of transmission to other patients versus the potential negative impact on the care of the affected patients under IP. The current pandemic with SARS-CoV2 demonstrates on a larger scale the medical and ethical dilemma between individual needs and responsibilities at the

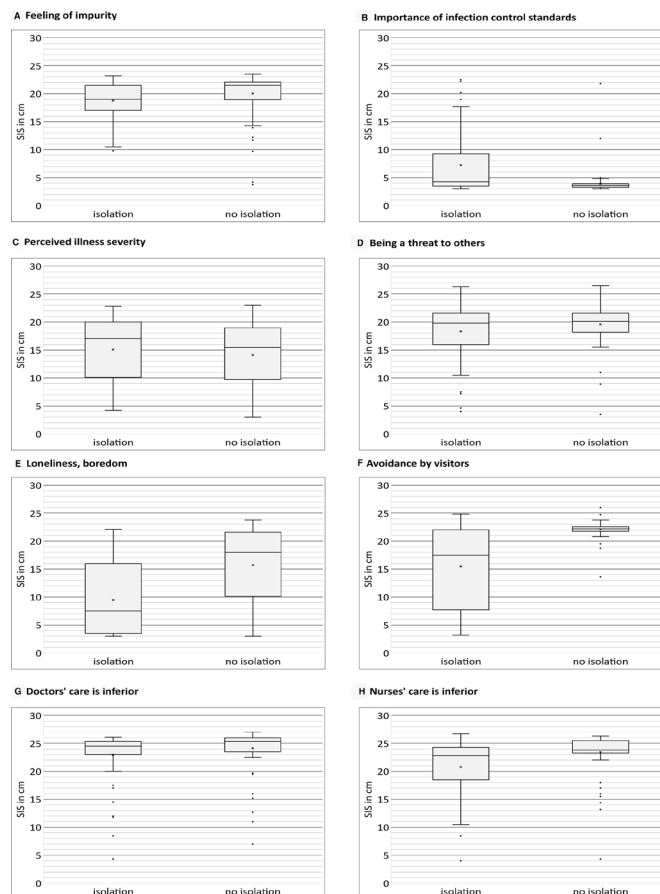


Figure 3 (A–H) Boxplots of the results of the Pictorial Representation of Illness and Self Measure (PRISM). Measuring the importance of different surrogates of mental and social well-being (A–H) in patients confined to isolation measures compared with non-isolated patients by means of PRISM with smaller self-to-illness separation (SIS) representing higher importance of this particular item.

population-level.²¹ Physicians face similar challenges at the hospital level: Patients may suffer from isolation to the benefit of the patient population. In this study, hospitalised patients in short-term IP significantly experienced various psychological constraints compared with their matched controls. Our results with respect to perceived inferior care of patients in isolation are in accordance with a large qualitative study.²² In addition, Gasink *et al* evaluated patient satisfaction and noted a consistently less favourable response in isolated patients compared with non-isolated patients.¹⁴ The differences, however, were not statistically significant, but sample size was low precluding firm conclusions. Another recent study suggested higher anxiety and depression scores in hospitalised MDRO patients under IP compared with non-MDRO patients but the groups were not well balanced with a significantly higher mortality rate and lengths of hospital stay in the MDRO-group suggesting more severe underlying illness which might have affected the results.²³ The findings of a Dutch research group at a large tertiary care hospital, however, are in contrast to our results¹³: Apart from being a single centre study and using different

Table 2 Linear mixed models for the prediction of change (in cm) in the self-to-illness separation in patients being placed under isolation precautions

	Univariate model					Multivariable model*				
	Coefficient	SE	95% CI		P value†	Coefficient	SE	95% CI		P value†
			Lower	Upper				Lower	Upper	
Nurses' care is inferior	-2.7	0.7	-4.0	-1.3	<0.001	-3.0	0.7	-4.4	-1.6	<0.001
Doctors' care is inferior	-1.2	0.6	-2.4	0.1	0.061	-1.3	0.7	-2.6	0.0	0.045
Avoidance by visitors	-6.7	0.9	-8.2	-5.2	<0.001	-6.8	0.9	-8.3	-5.2	<0.001
Feeling bored and lonely	-6.3	1.0	-8.3	-4.2	<0.001	-6.7	1.1	-8.8	-4.5	<0.001
Being a threat to others	-1.2	0.7	-2.5	0.1	0.070	-1.1	0.7	-2.4	0.1	0.079
Perceived illness severity	1	1	-0.8	2.8	0.292	1.2	0.9	-0.7	3.2	0.218
Importance of IPC measures	3.3	0.7	2.0	4.6	<0.001	3.4	0.7	2.2	4.7	<0.001
Feeling of impurity	-1.3	0.6	-2.4	-0.2	0.024	-1.3	0.6	-2.5	-0.1	0.029

*Adjusted for age, sex, McCabe score and psychiatric disorder as fixed effects, and ward (surgical vs medical) as random effect.

†A Bonferroni-corrected p-value of <0.006 was considered statistically significant.

IPC, infection prevention and control.

outcome measurement tools, confounding variables may have contributed to the indifferent levels of depression and anxiety among short-term-isolated and non-isolated patients. The Dutch infection prevention and control strategies are well known to be very strict countrywide but are also associated with one of the lowest MDRO incidence rates.^{24 25} Therefore, we assume that the attitude of Dutch patients under IP is more appreciative. Compared with the study by Day *et al*, who attributed the higher levels of depression and anxiety to the presence of existing psychiatric disorders rather than to short-term contact isolation,¹⁵ the proportion of patients with a history of psychiatric disorders was significantly higher in our control group, suggesting that the negative effects on mental well-being in our study were probably underestimated in the isolated patient cohort.

Implications of our results for clinical practice

IP require financial and human resources in hospitals.^{26 27} Barker *et al* showed that nurses but not doctors need significantly more time in rooms with patients in contact precautions.²⁸ At least from a nurse's perspective, this additional workload leads to, for example, less frequent visits of the patient, which may result in a perceived inferior quality of care from a patient's point of view.⁶ From an ethical perspective, IP have been criticised for their unfair participant selection, for example, patients under IP carry the risk of potential harm to the benefit of all other patients not identified as being infectious.²⁹ Furthermore, IP alone do not prevent per se infectious complications in the respective individual but aim at preventing transmission of a potential harmful pathogen to other susceptible patients despite their considerable lower infectious risk.⁶

Simply abandoning IP—suggested for endemic MRSA or vancomycin-resistant Enterococcus³⁰—to relief an individual patient while putting other patients at risk for acquisition may also increase the risk for outbreaks

of gram-positive³¹ as well as of gram-negative MDRO³² or emerging pathogens such as *Candida auris*.^{33 34} Several studies indicate that training of staff in infection prevention as part of a prevention bundle effectively reduces healthcare associated infections related to MDRO.^{35–37} However, we are not aware that such educational programmes routinely address how negative psychological impacts of IP could be mitigated. Although concepts for accommodating colonised or infected patients in a multibed room instead of a single room have been evaluated, they focused on prevention of transmission³⁸ or feasibility and acceptance by healthcare workers³⁹ but did not examine the psychological impact on patients. Besides, a considerable proportion of isolated patients are not well informed about their reasons for isolation and its value for the community¹⁴; thus, better information may help to decrease the negative impact of IP. A novel approach would be a programme that alleviates the negative side effects of IP while preserving the positive effect on transmission.

Strengths of this study

We applied a matched cohort design and linear mixed models allowing us to control for the most important confounders. It is the first study that uses a validated psychological assessment tool with a continuous measurement scale for the topic of infection control. The tool allows the patient to provide more accurate and precise responses that was not yet feasible with other tools. Application of this tool also allowed to evaluate other aspects not considered in standardised depression questionnaires.

Weaknesses in the study

First, we did not systematically ask nurses about their workload, nor was there a formal auditing of adherence with infection control standards. Whether this had an impact on the result and the direction of the impact is difficult to conclude. However, we subsequently checked on-site

the additional workload for certified nurses that was on average 55 min higher per patient in isolation.²⁶ Second, since there is no reference standard to assess the impact of isolation on psychological strains, the performance of this tool remains ill-defined for this topic and results may differ when the tool is applied in another setting. Third, application of this instrument did not allow to evaluate the precise factors that led to impaired mental well-being. Finally, our sample was too small to perform a more in-depth analysis of the relation between the SIS and other host or ward factors. Similarly, the sample size did not allow us to conduct subgroup analyses related to the different pathogens.

CONCLUSIONS

This study suggests that IP negatively affects mental and social well-being of patients. IP to prevent transmission in hospitals may become more and more important, and therefore, programmes to minimise side effects of IP should be integrated to decrease negative psychological effects on the individual patient while preserving the protective effect for other patients. The fact that the isolated patients also acknowledged the need for the isolation measures may suggest that an intervention with provision of easy-to-understand information could reinforce these positive aspects and reduce suffering.

Contributors AW and RN conceived the study. RLF collected the data and wrote a preliminary draft. MD was responsible for data management. DV-G performed the statistical analyses, interpreted the data, put them into context with current literature and wrote the manuscript. AW and RN critically revised the manuscript. AW is responsible for access to the data and data accuracy. AW as guarantor has the full responsibility for the conduct of the study and the overall content and controlled the decision to publish. All authors read and approved the final manuscript.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The study was approved in August 2011 by the Ethics Committee Basel, Switzerland, as a masters thesis. The project is registered under the number 2011/25. However, at that time no official dispositions were issued. We obtained written informed consent from all the study participants or their next kin. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Data are available from the corresponding author upon reasonable request.

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