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Research Article

# Admissions and Re-Admissions in an Intensive Care Unit for Patients Aged 65 and Older: A Registry Study

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**Abstract**

**Introduction:** Approximately half of the patients who receive intensive care in Sweden are 65 years or older. Previous research has found that older patients receive less treatment with worse outcomes than their younger counterparts. It has also been discussed if admissions and re-admissions of older frail patients to the intensive care unit can be prevented.

**Aim:** We aimed to describe ≥65 year's old patients' treatment, length of stay in the ICU, condition severity, and mortality and to compare the occurrence of re-admittances among patients. Another aim was to investigate from where patients were admitted and discharged to after the ICU.

**Method:** A retrospective descriptive and exploratory design was used. Data from an ICU registry and 155 randomized patient records were analyzed. During 2013, 2,019 care events, involving 1,818 patients, occurred. Of these, 895 ICU care events involved patients aged ≥65 years.

**Result:** About 49% of the patients 65 years and older had died within one year. Significantly more of these patients independent of re-admittance or not, died within 30 respectively 365 days. The average Simplified Acute Physiology Score was 59.6. The average length of stay for the 895 care events was 57.8 hours compared to 56.2 for those younger than 65 involving 1124 care events). Patients older than 80 years had shorter ICU stay than patient younger than 80 years. However, the length of stay for patients cared for once or more was similar for patients younger or older than 65 years. Re-admitted patients had a longer stay than those just cared for once. About 8% of patients were re-admitted. Of the 155 older patients, 128 had chronic diseases, and 13% were re-admitted up to five times. A majority of the patients were admitted to the ICU and discharged to wards at the same hospital.

**Conclusion:** Careful discharge planning, especially of frail older patients, by staff at wards, district nurses, community nurses, may minimize re-admittances.

**Keywords:** Older Patients; Intensive Care Treatment; Mortality; Re-Admittance; Registry

## Introduction

According to the Swedish Intensive Care Registry (SIR) [1], about 50,000 patients are treated in intensive care units (ICUs) in Sweden every year. Approximately half of the admissions were patients 65 years and older [2]. According to Laake et al. [3], there will be a 40% increase of older patients in the ICU within 10 years, which would increase the need of ICU beds. Flaatten [4], suggested that the ICU capacity must increase, as the Nordic countries have on average very few beds (5.8-9.1 beds) in relation to the European average of 11.5 beds per citizen. There is, at the moment, no individual available figure for Swedish ICUs. Flaatten [4], also discussed the importance of using prediction tools to identify patient groups, especially those with chronic diseases, who are cared for in other health care settings, so they can be given preventative treatment and care at an earlier stage of their conditions. This preventative approach could decrease the risk of acute, severe medical conditions, and thus decreasing the need of intensive care. Nurses in the community and primary carers have a great opportunity to identify frail patients with high risk factors, such as chronical diseases and malnutrition, and take actions to prevent further deterioration of their patients' conditions, limiting the occurrence of ICU admissions.

It is also important to take factors that might increase re-admittance to hospitals and ICUs into consideration. There may be comorbidity with specific illnesses that influences older patients' intensive care outcomes [5, 6], which may also result in hospital re-admittance. Another key factor is malnutrition. Sheean et al. [7], noted that if older patients suffered from malnutrition at the time of admission to the ICU, they were in a greater need of hospital care, had longer hospital stays, and were more likely to die during their ICU stay.

In several studies, mortality among older patients in intensive care had been found to be higher compared to younger patients [8,9]. Also, Brandberg, Blomqvist and Jirwe [10], found that patients older than 80 had higher hospital mortality than patients who were 65-79 years old. They also discovered that these older patients tended to receive less treatment, such as invasive ventilator support. Moreover,




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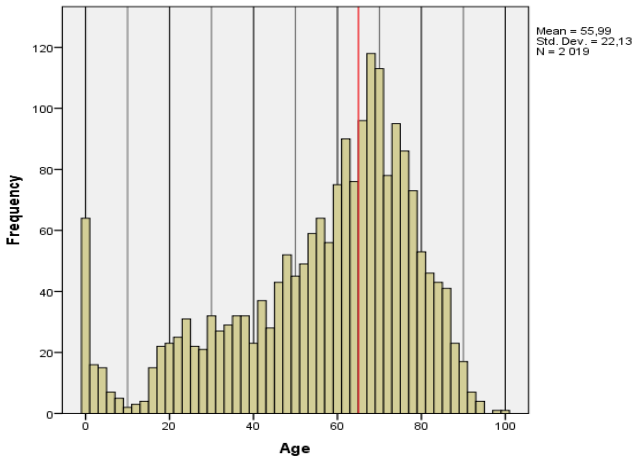


**Figure 1:** Age distribution of all care events (N=2019) during year 2013.

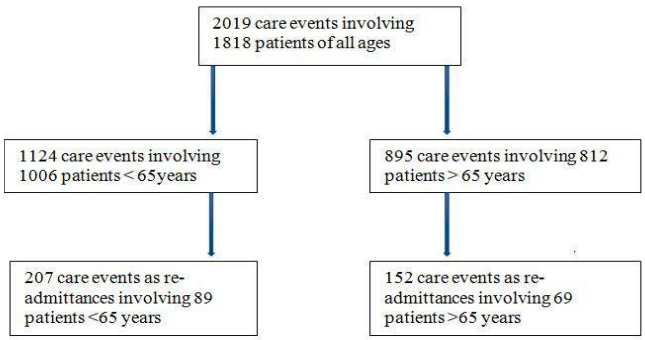


**Figure 2:** Care events during the year 2013 at the ICU, number of patients younger than 65 and 65 years and older and re-admittances.

these patients had shorter hospital stays compared to their slightly younger counterparts. Patients above 80 years had higher hospital mortality and received less invasive ventilator support which may have influenced shorter ICU stay [10].

However, it is also important to note where patients are discharged. For example, Rodrigues de Oliveira et al. [11], reported that patients younger than 60 were, to a greater extent, discharged to a hospital ward following their intensive care stay compared to those 60 years and older who were more likely to be discharged to semi-intensive care units. This raises a question if and how the estimation of patients' frailty in connection with ICU discharge could be used in further care planning. Could such estimation, for example, result in fewer re-admittances? Knowledge about these factors is important for planning for patients' discharge from the ICU as well as continuity and need for post-ICU care.

Our study aimed to describe patients', who are 65 years or older, treatment, length of stay in the ICU, condition severity, and mortality and to compare the occurrence of re-admittances between older and younger patients. Another aim was to investigate from where patients were admitted to the ICU as well as where the patients were discharged to after their ICU stays.

## Material and Methods

Data were collected from the ICU Registry System (Ivarätt) at a university hospital general ICU in Sweden for the year 2013. The ICU had 20 beds and was a general unit for all ages, excluding neonatal children. Patients were cared and treated for surgical and internal medicine issues and the ICU was also a center for transplants and trauma. During the year 2013, 2,019 ICU care events, involving 1,818 patients of all ages were registered. Of these patients, 812 were 65 years or older. In the second part of the study, 155 patients were randomly invited from the population of 812 to participate in the study by giving the researcher permission to collect data from their records. Before sending the invitation letter containing the information about the study and a request for permission to access the patient's records, the researchers determined that the patient was still alive. As specified in the invitation letter, clinical and demographic data, such as civil status, residential circumstances, arrival to and discharge from the ICU, and presence of chronic illness were collected. The reason for investigating a randomized sample of 155 patients was to investigate the older patients' trajectory of care, including admittance and discharge from the ICU.

In the absence of a reply to the invitation letter, a reminder was sent after four weeks. A total of 196 invitation letters were sent and 155 patients 65 years and older agreed (79%) to participate and signed the consent form. The Regional Ethics Committee at the University of Gothenburg Sweden approved the study before data collection commenced (Dnr 016-14).

### Statistical analysis

All calculations and data processing are performed on registered care events (as opposed to unique individual patients) this is how data is represented in the ICU Registry system and how the national ICU Registry (SIR) process their statistics. Descriptive statistics, such as median, mean, and SD were used for the retrieved data from the registry and from the patient records. Chi-square and non-parametric tests for comparisons were performed concerning treatment and mortality between age groups, elective and non-elective admissions, where the patients arrived from, and whether they had chronic illnesses or not. A student's T-test was used to compare mean values of SAPS3 and LOS. We hypothesized there would be no differences in SAPS3 and LOS between those patients cared for once and those cared for more than once, independent of age. It was calculated that a sample size of 150 patients was representative of the population (1,818 patients). Calculations were conducted using MS Excel 2013(data preparation) and IBM SPSS version 22 (actual statistical calculations).

## Results

The results will be presented in two parts. In the first section, the data from the ICU Registry System (Ivarätt), including the 2019 care events analyzed by age, gender, medical condition, Mechanical Ventilation (MV), Non-Invasive Ventilation (NIV), and Continuous Positive Airway Pressure (CPAP), Length of Stay (LOS), mortality, and re-admittances are presented. In the second, data from the randomly selected sample of 155 patient records are presented with some demographic data, patients' stay before arriving in the ICU, and to where patients were discharged.

During 2013, a total of 2,019 care events involving 1,818 patients of all ages took place. Of these, 1,124 care events involved patients younger than 65 years (n = 1,006) and 895 care events (44%)

**Table I:** Number of required care events for patients younger and older than 65 years (N = 1,818).

| Number of care events | Younger than 65 years (%) | 65 year and older (%) | All (100%) |
|---|---|---|---|
| One | 917 (55) | 743 (45.5) | 1,660 |
| Two | 71 (55) | 58 (44) | 129 |
| Three | 11 (58) | 8 (42) | 19 |
| Four | 4 (67) | 2 (33) | 6 |
| Five | 3 (75) | 1 (25) | 4 |
| Number of patients | 1,006 | 812 | 1,818 |

**Table II:** Invasive, non-invasive (exclusive CPAP), and CPAP treatments for patients younger or older than 65 who were cared for once and/or re-admitted, *p=.0005.

| **Invasive treatment** | **No n = 1,152** | **Yes n = 867 (%)** | **Total** |
|---|---|---|---|
| <65years, 1 care event | 526 | 391 (43) | 917 |
| >65years, 1 care event | 421 | 322 (43) | 743 |
| <65years, ≥2care events | 123 | 84 (41) | 207 |
| >65years, ≥2care events | 82 | 70 (46) | 152 |
| **Non-invasive*** | | | |
| <65years, 1 care event | 830 | 87 (9.5) | 917 |
| >65years, 1 care event | 615 | 128 (17) | 743 |
| <65years, ≥2care events | 184 | 23 (11) | 207 |
| >65years, ≥2care events | 109 | 43 (28) | 152 |
| **CPAP*** | | | |
| <65years, 1 care event | 904 | 13 (1) | 917 |
| >65years, 1 care event | 712 | 31 (4) | 743 |
| <65years, ≥2care events | 204 | 3 (1) | 207 |
| >65years, ≥2care events | 143 | 9 (5) | 152 |

for patients 65 years and older (n = 812). The age distribution for all patients is presented in (Figure 1). Of the 812 patients 65 and older (Md 73 years), 363 were women and 449 men. As can be seen in (Figure 2), 69 patients (of the 812), 65 years and older were re-admitted to the ICU within the year 2013, which accounted for 152 care events. When comparing these data with re-admitted patients younger than 65 (with 89 patients involving 207 care events) and number of re-admittances, older patients were not re-admitted to a greater extent than patients younger than 65 years (Table I).

## Age, Gender, and Treatment

Men aged 65 and older who received care at the ICU were significantly younger than women in the same category (Md 74.1 compared to 75.2; p = 0.0466). Preliminary calculations indicated no significant relationship between gender and treatment. However, the older the patient was, the less likely they were to receive MV (p = 0.011). About 6% (n = 56) of all the ICU care events involving patients 65 years and older required dialysis.

There were no significant differences between younger and older patients in regard to invasive treatment and whether the patients were re-admitted or not. However, when it came to non-invasive treatment and CPAP, fewer patients, independent of age, received such treatment (Table II). However, more patients 65 years and older received non-invasive treatment and CPAP regardless of the number of times they required care compared to patients younger than 65 (p<0.0005)

**Table III:** The average Simplified Acute Physiology Score (SAPS3) and Length Of Stay (LOS), and mortality within 30 days among patients younger and older than 65 years in relation to care events (p=.0005).

| **SAPS3*** | **n** | **Mean (SD) score** |
|---|---|---|
| <65years, 1care event | 917 | 41.97 (20.036) p=.003 |
| >65years, 1care event | 743 | 59.46 (14.844) |
| <65years, ≥2care events | 207 | 46.59 (19.378) |
| >65years, ≥2care events | 152 | 60.31 (12.078) |
| **LOS*** | **n** | **Mean (SD) in hours** |
| <65years, 1care event | 917 | 51.04 (83.466) |
| >65years, 1care event | 743 | 53.60 (82.724) |
| <65years, ≥2care events | 207 | 79.13 (132.030) |
| >65years, ≥2care events | 152 | 78.61 (138.945) p=.001 |
| **Survival/Mortality within 30 days*** | **Survived n = 1,652** | **Died n = 361 (% )** |
| <65years, 1care event | 825 | 92 (10) |
| >65years, 1care event | 538 | 205 (28) |
| <65years, ≥2care events | 188 | 19 (9) |
| >65years, ≥2care events | 107 | 45 (30) |

**Table IV:** Demographic and clinical data for patients in the patient record study group (N = 155). ED=Emergency Department. Significant differences * = p < 0.001.

| **Variables** | **Women (n = 77)** | **Men (n = 78)** | **All (N = 155)** |
|---|---|---|---|
| Mean age in years (SD) | 73.09 (10.59) | 72.78 (9.87) | 73.01 (10.21) |
| Married | 39 | 55 | 94* |
| Single/unmarried/widowed | 14 | 10 | 24 |
| Living together with someone, yes/no | 44/11 | 57/9 | 101*/20 |
| Living in a house | 8 | 11 | 19 |
| Living in an apartment | 26 | 20 | 47* |
| Senior apartment | 1 | 0 | 1 |
| **ICU from same hospital** | **62** | **55** | **118*** |
| **ICU from another hospital** | **12** | **20** | **32** |
| **ICU from no hospital** | **3** | **1** | **4** |
| **Elective/non-elective admission to the ICU** | **29/48** | **28/50** | **57/98*** |
| Admitted from an ED at the same hospital | 27 | 27 | 55* |
| Admitted from a ward at the same or other hospital | 12 | 20 | 32 |
| Admitted from another ICU | 5 | 8 | 13 |
| Admitted from an operation theatre/ postoperative unit from the same hospital | 31 | 22 | 53* |
| **Chronic illness yes/no** | **65/9** | **62/5** | **127/14*** |
| Discharged to another hospital | **20** | **24** | **44** |
| Discharged to a postoperative unit at the same hospital | **4** | **3** | **7** |
| Discharged to award at the same hospital | **44** | **38** | **82*** |
| Discharged to another ICU at the same hospital | **6** | **10** | **16** |
| Discharged to a patient's home | **1** | **0** | **1** |

**Table V:** Number of patients cared for once and re-admitted patients, Simplified Acute Physiology Score (SAPS) and length of stay (LOS) in hours (N = 155, *p=.017).

| Number of times cared for | Number of patients | SAPS mean, (SD), range, median | LOS mean, (SD), range, median |
|---|---|---|---|
| Once | 133 | 53.6, (12.76), 25-96, 51 | 59.9, (73.39), 1.47-433.32, 30.38 |
| Twice | 19 | 53.92, (11.1), 33-78, 51.5 | 68.98, (74.57), 3.5-284, 37.51 |
| Three times | 3 | 62.2, (4.89), 54-71, 64 | 68.4, (80.52), 1.67-208.8, 34.52* |

### Medical Condition and Mortality

The average SAPS3 for patients 65 years and older, involving 895 ICU care events, was 59.6, (SD 14.41; (Table III). There was a significant, positive correlation between the SAPS3 score and the patient's age ($p < 0.0001$), with older patients having a higher SAPS3. For every 10 years in an age increase, the SAPS3 is estimated to increase 6.7 units, showing that SAPS3 in itself contains age calculations. There were no significant differences in SAPS3 scores between men and women.

Therefore it was expected that the average SAPS3 was significantly higher (2-5 times) for the 69 re-admitted patients (consisting of 152 care events) 65 years and older (60.31; SD 12.08) compared to 46.59 (SD 19.38) for patients younger than 65 (n = 89, involving 207 care events, ($p<0.0005$). There was, however, no significant difference in SAPS3 among patients 65 years and older regardless of re-admission (Table III).

In total, 90 patients (11%) 65 years and older died during their stay in the ICU. Most of these patients were older than 80. For mortality rates, 411 patients (51%) patients 65 years and older had survived one year following discharge from ICU while 401 had died. Within 30 days after discharge from the ICU, 162 (22%) had died, and a further 149 (27%) had died in between 31 days to one year following discharge.

Significantly more patients 65 years and older, who had been re-admitted to the ICU, died within 30 days following discharge from ICU compared to patients re-admitted and younger than 65. It was also found that significantly more patients 65 years and older who had been cared for only once died within 30 days following discharge from the ICU compared to their younger counterparts (Table III).

### Length of Stay

The average LOS in the ICU for patients 65 years and older calculated on the 895 care events was 57.85 hours (SD 95.02). LOS for patients 65-80 years was on average 84 hours, patients 81-90 years 54 hours, and patients 90 years and older were on average staying 30 hours ($p = 0.024$). The average LOS for the re-admitted patients 65 years and older was 78.60 hours (SD 138.94 hours; Md 41.56 hours) and 79.13 hours (SD 132.03; Md 29.62 hours) for patients younger than 65 years. As can be expected, those patients <65 years who were re-admitted had a significant higher average LOS compared to those not re-admitted, 79.13 and 51.04 hours ($p<0.0005$), respectively. The same was found for patients >65 years (78.60 and 53.60 hours, respectively, $p = 0.001$. (Table III).

### Results Based on Data from the Patient Records

A randomly selected sample was drawn from the 812 patients who were 65 years and older, consisting of 155 patients (76 women, 79 men). As can be seen in (Table IV), the average patient age was 73 years (SD 10.21). Most of the patients were admitted to the ICU from an operation theater, postoperative unit, or directly from the emergency department at the same hospital as the ICU ($p < 0.001$, (Table IV). When comparing non-elective and elective admissions to the ICU, it was found that most patient arrivals were unplanned (99 and 57, respectively). Most of the patients (n = 99) were discharged from the ICU to a ward or unit at the same hospital. It was also found that an overwhelming majority of the patients receiving care in the ICU had chronic diseases: 128 of the 155 studied patients had chronic diseases; whereas only 14 had no chronic diseases ($p < 0.001$). Information was missing for 12 patients.

When comparing patients aged 65-75 years and 76-90 years, no significant differences were found concerning living and residential circumstances before arriving to the ICU or at discharge, elective or non-elective admission, and the frequency of chronic diseases. No differences were found between men and women. The average LOS for all 155 patients was 62.31 hours (SD 73.66; Md 33.15), and the average SAPS3 was 54.10 (SD = 12.25; Md 53). Compared to the figures of all patients 65 years and older, the average LOS was 57.85 hours (SD 95.02; Md 28), and the average SAPS3 was 59.61 (SD 14.41; Md 25).

As can be seen in (Table V), a majority of the 155 patients were only cared for once, while 22 were re-admitted, representing 47 care events. There was no significant difference in the average LOS between those who were cared for only once and those cared for twice. However, a significant difference was found in LOS between those cared for once and those cared for three times ($p = 0.017$). The average SAPS3 was also higher for patients that were re-admitted three times.

## Discussion

About 4-5% of the patients had been re-admitted to the ICU in both age groups. As we have not found other studies that report re-admittances, the occurrence of re-admittances cannot be compared. However, the occurrences of re-admittances can be discussed from several angles. The occurrence of re-admittances of patients to the ICU could be caused by the limited number of ICU beds compared to the patients' needs for intensive care. This shortage of beds may had required difficult decisions to move patients even if they still were in need of intensive care and then readmitted when a bed was available. Other reasons could be that the patients were discharged too early, their medical condition was assessed too optimistically, or especially for the older patients, they may not have received satisfactory treatment. This may have been reflected in the finding that the older the patient was, the less invasive treatment they received. On the other hand, invasive treatment could also be seen as too uncomfortable for the oldest and, therefore, seen as unethical. This argument can be supported by the finding that patients 65 years and older received non-invasive and CPAP treatment to a greater extent.

The average SAPS3 for care events involving patients older than 65 years was 59.6, which is higher than in a study by Tabah et al. [12], who found an average SAPS3 of 45 (SD 18.3). As the assessment of patients' medical conditions included calculations based on age, it is not surprising that the average SAPS3 was higher for older patients compared to younger ones. However, it is somewhat surprising that there was no significant difference in the average SAPS3 between older patients who were and who were not re-admitted. Possible explanations for this could be that those not re-admitted might have been cared for in a ward where the staff was experienced in more advanced care, that the nurses treating them, had a bachelor or master's degree, or they had a low patient-nurse ratio. It is known that having lower workloads and nurses with at least a bachelor degree decreases the mortality rate in the first 30 days among patients 50 years and older [13]. It can be questioned if the degree of re-admittances was also connected to these factors.

Our findings of a significant relationship between older patients, a higher risk of death, and a shorter LOS was in line with previous research by Brandberg, Blomqvist and Jirwe's [10]. We found that 11% of patients (n = 90) 65 years and older, a majority being 80 or older, died during their ICU stay. Within 30 days after discharge, 22% had died. These figures can be compared to the findings by Zeng et al. [14], who found 45% died within 30 days and 38.7% within 90 days. Patients who died within 30 days had a higher frailty index than those who survived for 300 days. In our study, we found that 401 of the 812 (49.4%) patients 65 years and older had died within one year following discharge from the ICU, and of these, about 23% were 80 years or older. This finding could be compared to Tabah et al. [12], who found that 68.9% of their patients aged over 80 years had died within one year. However, it has to be taken in consideration that in Tabah et al.'s study only patients 80 years and older were included, which may explain the difference between their and our study. In our study, it was found that patients 65 years and older died to a greater extent within 30 days regardless of re-admittance or not.

In our study, older elderly patients had a shorter LOS. The LOS was approximately 2-3.5 days for patients 65 years and older compared to the 3-6 days found in other studies [13,16]. However, the average LOS for re-admitted patients younger and older than 65 years was similar; about three days. The average LOS for re-admitted patients in both age groups was higher than for patients only cared for once, where the average LOS was about 2 days. The difference between our findings and Tabah et al. [12] and Heyland et al. [15] could be due to fewer available beds in Sweden compared to other European countries. If there were a lack of beds, the strain to discharge patients to other units/wards increases even if patients' medical conditions would normally demand a longer stay in the ICU.

In our study based on patient record data (N = 155), significantly more patients had a chronic disease and, therefore, were more vulnerable and frail. About 64% of the ICU admittances were unplanned. We have not found any study that report this issue, which makes it impossible to compare or value if this figure. We found 118 (76%) of the patients had been admitted to the ICU from the same hospital and 32 (21%) from another hospital. Of these, 108 were admitted from emergency departments, operation theaters, or postoperative units at the same hospital. These findings can partly be explained by the fact that the regional/university hospital ICU in question serves as a referral hospital for all critically ill patients in the area. However, most patients were admitted from the same hospital. Similar figures were found in the study by Orsini et al. [16] where 74.6% of the patients were admitted from emergency department and 18.3% from medical-surgical wards. The reason for admittance of patients from wards can be explained by an acute deterioration of the patient's medical condition, by lack of knowledge among staff in caring for the critically ill, and/or a lack of staff. Another reason could be the lack of beds and the availability of advanced medical technical equipment in the referring wards.

The average SAPS3 and LOS for these 155 patients were 62.22 and 62.31 hours, respectively compared to the population of 812 patients that had 59.61 and 57.85 hours, respectively. These differences in LOS and SAPS3 may indicate that a majority (83%) of these patients had chronic diseases. According to our findings, the sample is not representative for the whole population of patients 65 years and older for the year 2013. The fact that the sample includes survivors (i.e. patients who were still alive two years after discharge from the ICU) needs to be taken into consideration, as this could in part explain some of the discrepancy.

It was found that 14% (n = 22) of the patients (N = 155) had been re-admitted up to two times after the first care event. The comparing figure for all patients (N = 1,818) independent of age was about 8%. This may also reflect the fact that more patients in the group of 155 were chronically ill. This can be compared with Orsini et al. [16] study where two patients out of 71 were re-admitted to the ICU within 30 days of their first admission. The mean age for the 71 patients was 83 years, but there is no information about the occurrence of chronic diseases among the patients, Another reason might be that the 155 patients in our study suffered from more severe conditions and were discharged too early from the ICU. As has been discussed, the average number of ICU beds in Nordic countries is lower than in other European countries, and, therefore, patients may have been discharged due to the lack of beds. However, it is not known if patients together with their relatives had asked for discharge due to a wish to receive less intensive treatment and care and being exposed to ICU stressors.

However, re-admittances and a high turnover of patients has an impact on nurses' workload in relation to documentation, medical technical tasks, and lack of time for practical preparations, thereby increasing the risk for adverse events and errors. Moreover, repeated transfers of patients between units may also cause disorientation and further patient suffering. Further studies are needed concerning the consequences of patient re-admittances.

Our study was a single-center study involving a general referral ICU at a university hospital. Our results can, therefore, not be extrapolated to different types of ICUs, such as ICUs located at county council hospitals. However, our study can contribute to the discussion about how to best care for older patients. A strength of this study is that it included all patients cared for at the ICU during the year 2013. The randomized sample size of 155 patients was considered to reflect the population of older patients treated at the ICU. However, more patients in this group were readmitted compared to the whole group of 812. When evaluating the 155 patient

records, it was difficult to find information about the patients' living circumstances and care prior to their admission to the ICU and about to where the patients were discharged following their ICU care. This lack of information may indicate that there are short comings in the continuity and cooperation between the various hospitals, primary health care, and community health care services. It is unclear if some of the admissions from wards at the same hospital, patients' homes, and nursing homes could have been avoided with more preventative medical treatment. One way could be to assess the older patients' frailty. Zeng et al. [14] used a frailty index as a predictor of mortality among older patients. The frailty index was broadly defined by clinical and biological characteristics and incorporated patients' health problems i.e. what was wrong, including both the occurrence of frailty and its severity. Baldwin et al. [17] used Fried et al.'s [18], 5 components frailty index within four days of hospital discharge as a predictive tool. They concluded that the frailty index could be measured just before hospital discharge for patients cared for in ICUs. Further research should investigate if a frailty index for older patients in primary and/or home care as well as in the ICU could decrease admittances and re-admittances to ICUs and if these are connected to nurses' education level.

## Conclusion

For the older patients, re-admittances might be harming. More patients 65 years and older that had been re-admitted died within 30 days compared to younger patients. Therefore, careful discharge planning, especially for frail older patients, is essential and should include the ICU physicians and nurses, the physicians and nurses in the hospital wards, and also district nurses, community nurses, and patients' relatives. This may result in fewer re-admittances and may also prevent mortality especially in patients with comorbidities as these patients could be seen as frail. In order to decrease admittances to the ICU, a frailty index should be used to identify risk factors among older patients in primary and community care as well as in ICU and in post-ICU care. By identifying these deficits, treatment and care actions, could decrease the risk for further deterioration. In relation to the findings of re-admittances of older patients to the ICU, it could be that also post-ICUs or semi-intensive care units may be beneficial in preventing ICU re-admittance. Another important question left to be teased out is if admittances and re-admittances are associated to nurse staffing and education in the hospital wards and community health care.

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## References

1. SIR Swedish Intensive Care Registry. Annual report. 2011.
2. Boumendil A, Somme D, Garrouste-Ortegas M, Guidet B. Should elderly patients be admitted to the intensive care unit? Intensive Care Med. 2007; 33: 1252-1262.
3. Laake JH, Dybwik K, Flaatten H, Fonneland IL, Kvåle R, Strand K. Impact of the post-world war II generation on intensive care in Norway. Acta Anaesthesiol Scand. 2009; 53: 1-6.
4. Flaatten H. The impact of age in intensive care. Editorial. Acta Anaesthesiol Scand. 2014; 58: 3-4.
5. Boumendil A, Maury E, Reinhard I, Luquel L, Offenstadt G, Guidet B, et al. Prognosis of patients aged 80 years and over admitted in medical intensive care unit. Intensive Care Med. 2004; 30: 647-654.
6. Inouye SK, Peduzzi PN, Robinson JT, Hughes JS, Horwitz RI, Concato J, et al. Importance of functional measures in predicting mortality among older hospitalized patients. JAMA. 1998; 279: 1187-1193.
7. Sheean P, Peterson S, Chen Y, Liu D, Lateef O, Braunschweig C, et al. Utilizing multiple methods to classy malnutrition among elderly patients admitted to the medical and surgical intensive care units (ICU). Clin Nutr. 2013; 32: 752-757.
8. De Rooij SE, Abu-Hanna A, Levi M, De Jonge E. Factors that predict outcome of intensive care treatment in very elderly patients: a review. Critical Care. 2005; 9: R307-R314.
9. Brunner-Ziegler S, Heinze G, Ryffel M, Kompatscher M, Slany J, Valentin A, et al. "Oldest old" patients in intensive care: prognosis and therapeutic activity. Wien Klin Wochenschr. 2007; 119: 14-19.
10. Brandberg C, Blomqvist H, Jirwe M. What is the importance of age on treatment of the elderly in intensive care unit? Acta Anaesthesiol Scand. 2013; 57: 698-703.
11. Rodrigues de Oliviera VC, de Souza Nogueira, Cardosode de Sousa RM. Clinical evolution of adult, elderly and very elderly patients admitted in intensive care units. Rev. Latino-Am Enferagem. 2011; 19: 1344-1351.
12. Tabah A, Philippart F, Timsit JF, Willems V, Français A, Leplège A, et al. Quality of life in patients aged 80 or over after ICU discharge. Crit Care. 2010; 14: R2.
13. Aiken L, Soane D, Bruyneel L, Van den Heede K, Griffiths P, Busse R, et al. Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. Lancet. 2014; 383: 1824-1830.
14. Zeng A, Song X, Dong J, Mitnitski A, Liu J, Guo Z, et al. Mortality in relation to frailty in patients admitted to a specialized geriatric intensive care unit. J Gerontol A Biol Sci Med Sci. 2015: 70: 1586-1594.
15. Heyland D, Cook D, Bagshaw SM, Garland A, Stelfox H, Metha S, et al. The very elderly Admitted to ICU: A Quality Finish? Crit Care Med. 2015; 43: 1352-1360.
16. Orsini J, Butala A, Salomon S, Salomon S, Studer S, Gadhia S, et al. Prognostic factors associated with adverse outcome among critically ill elderly patients admitted to the intensive care unit. Geriatr Gerontol Int. 2015; 15: 889-894.
17. Baldwin MR, Reid MC, Westlake AA, Rowe JW, Granieri EC, Wunsch H, et al. The feasibility of measuring frailty to predict disability and mortality in older medical intensive care unit survivors. Journal of Critical Care. 2014; 29: 401-408.
18. Fried LP, Tangen CM, Newman AB, Hirsch C, Gottdiener J, Seeman T, et al. Frailty in older adults: evidence for a phenotype. Journal of Gerontology A Biol Sci Med Sci. 2001; 56: 146-156.




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