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Quality of life after COVID-19 induced critical illness: do the old survivors suffer more?

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Abstract: *Objective:* During the first wave of the COVID-19 epidemic in Belgium, major concern existed regarding bed and nurse capacity to care for all ICU eligible patients. Since age is linked with increased comorbidity and potentially decreased quality of life, physicians may be reluctant to allocate scarce ICU beds to the elderly patients. However, we believe elderly patients with good premorbid quality of life can have sufficient quality of life after COVID-19 associated critical illness.
Methods: We retrospectively analyzed all 97 patients who were admitted to the ICU for severe COVID-19 induced respiratory failure from March 13th until June 20th 2020. Electronic patient files were queried for baseline characteristics and ventilation strategy. Data on outcome were collected in collaboration with our post-intensive care clinic. In this clinic, patients were contacted 8 to 12 weeks after discharge to screen for symptoms of the post-intensive care syndrome.
Results: Despite increased comorbidities in elderly patients, admission frailty scores were similar amongst all age groups. Mortality was higher in the elderly patient groups. Patients experienced a drop in self-reported quality of life after ICU admission. However, after dichotomization based on the age of 70 years old, the change in self-reported quality of life in the elderly does not appear to be significantly bigger than in younger patients.
Conclusion: Despite higher mortality rates in the elderly patient admitted to the ICU due to COVID-19 induced respiratory failure, the drop in self-reported quality of life is not affected by age. As such, ICU clinicians should look beyond crude ICU mortality and consider utilizing premorbid self-reported quality of life and frailty scores to estimate whether ICU admission adds value to the individual patients life.

Keywords: COVID-19; frailty; intensive care units; quality of life.

Introduction

COVID-19 infection, caused by SARS-CoV-2 was first documented in China in late 2019 (1). This SARS virus is known to have a wide spectrum of clinical manifestations, ranging from asymptomatic or mild infection to acute respiratory failure (1). In February 2020, the first cases were reported in Belgium and while in March 2020 the World Health Organization (WHO) declared COVID-19 a global pandemic, there was already a steep rise in number of cases which forced Belgian hospitals to reorganize. Both the amount of patients requiring intensive care and the speed at which they presented at the intensive care departments made it clear that the demand for intensive care unit (ICU) beds would rapidly overgrow the capacity. Therefore advanced care planning and a good critical care triage is necessary (2, 3). Although the elderly population is extremely vulnerable to have a poor course of COVID-19 illness with higher mortality rates (4-6), age by itself cannot be used for triage decisions but should be integrated with other clinical parameters like the Rockwood Clinical Frailty Scale (CFS). (7-10). Furthermore we are convinced that premorbid self-reported 'health related quality of life' (HRQoL) should also be assessed and used in conjunction with frailty scores as we believe that the elderly patient with good premorbid HRQoL can have sufficient quality of life after critical illness secondary to COVID-19 respiratory failure. The aim of this study is to present outcome data after severe COVID-19 infection with associated respiratory failure requiring intensive care. The main focus is on self-reported quality of life where a

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comparison is made between younger (<70 yo) and elderly patients (>70 yo).

Methods

We performed an observational mono-centric study according to the STROBE guidelines (11).

The study was conducted in Ziekenhuis Oost-Limburg (ZOL) Genk, a tertiary non-academic referral hospital in Belgium. Ethical approval for this study was obtained from ZOL GENK CTU ethical committee (approval number Z-2021051).

We retrospectively analyzed all patients that were admitted to the ICU for severe COVID-19 induced respiratory failure in a 4 month period from March 13th until June 20th during the first wave of the COVID-19 pandemic in Belgium. COVID-19 diagnosis was confirmed by reverse transcriptase-polymerase chain reaction on nasal swab. Electronic patient files were queried for patient characteristics, ventilation strategy, length of stay and outcome data. Our database included 97 patients admitted to the ICU. No patients were excluded from analysis once admitted to the ICU. Admission criteria were similar to those prior to the COVID-19 pandemic (12, 13).

The patients who survived ICU were contacted by phone 8 to 12 weeks after discharge. During this telephone interview – which was part of routine care after COVID-19 critical illness – an ICU physician screened for signs of post-traumatic stress disorder, general wellbeing and HRQoL both prior to ICU admission and at the current moment in time. In 61 responding patients (flowchart), HRQoL was assessed using the EQ-5D-5L questionnaire, a widely used, validated European questionnaire (Fig. 1) (14).

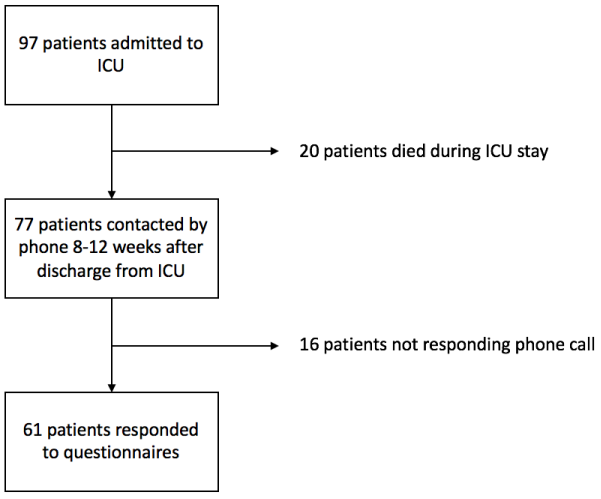

Fig. 1. – Flowchart.

This questionnaire consists of two sections: a descriptive system and a visual analogue scale. The descriptive system assesses the five domains of health as defined by Spilker: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression with 5 possible answers for each domain. The visual analogue scale (EQ-VAS) represents a scale ranging from 0 (worst possible health) to 100 (best possible health) (15).

Statistical analyses were performed using JMP (version 15.0). For continuous variables, we reported means with SDs and medians with IQRs. For categorical variables, we reported absolute numbers and percentages. Contingency tables were created for the different dimensions of the EQ-5D-5L questionnaire and compared between the age group '70+' and 'no 70+' using the fishers exact test. Additional box plots were constructed to evaluate the change in HRQoL before and after ICU admission, dichotomized according to age.

Results

Baseline characteristics of patients and ICU course

From March 13th until June 20th 2020, a total of 97 patients with COVID-19 associated respiratory failure were admitted to our ICU. Among the 97 patients, 62 patients (64%) were males. Median Acute Physiology And Chronic Health Evaluation (APACHE) IV predicted mortality, Charlson Co-morbidity Index (CCI) and CFS score were 29% (IQR 18-40), 4 (IQR 3-6) and 4 (IQR 3-5) respectively. Median APACHE IV predicted mortality and CCI scores increase with a rise in age, while CFS score remains stable amongst all age groups (table 1). Upon admission to the ICU, the majority of patients (85 patients) was started on High Flow Nasal Canula (HFNC) Oxygen, while only a minority (12 patients) was immediately intubated. During the ICU stay, an additional 27 patients received invasive mechanical ventilation due to refractory hypoxemic respiratory failure. Median HFNC therapy duration was 3 days (IQR 2-5), while median duration of invasive mechanical ventilation was 15 days (IQR 7-24). Invasive mechanical ventilation was more common in the younger age groups, the number of invasive ventilated patients in the age group ≥75<80 years old and in the age group ≥80 years old was 35% and 14% respectively. Length of stay (LOS) in the ICU and hospital was 8 (IQR 5-20) and 17 days (IQR 11-27) respectively among all ages. A trend towards longer ICU and hospital stay is seen in patients between 75-79 years old. In

Table 1

Patient data

	Overall	<65 years old	≥65 < 75 years old	≥75 < 80 years old	≥ 80 years old
Number	97 pts	39 pts	27 pts	17 pts	14 pts
male n (%)	62 males (64%)	25 males (64%)	16 males (60%)	13 males (76%)	8 males (57%)
APACHE 4 median (SD; IQR)	29 (15; 18-40)	17 (12; 13-24)	33 (15; 25-43)	33 (7; 30-37)	42 (11; 40-49)
CCI median (IQR)	4 (3-6)	2 (1-3)	4 (4-6)	5 (4-6)	7 (6-8)
Frailty median (IQR)	4 (3-5)	4 (3-5)	3 (3-5)	4 (3-5)	4 (3-6)
Survival number (%)	77 patients (79%)	38 patients (97%)	19 patients (70%)	13 patients (76%)	7 patients (50%)
HFNC number (%)	85 patients (88%)	32 patients (82%)	25 patients (93%)	16 patients (94%)	12 patients (86%)
Invasive ventilation number (%)	39 patients (40%)	18 patients (46%)	13 patients (48%)	6 patients (35%)	2 patients (14%)
HFNC duration median in days (SD, IQR)	3 (3; 2-5)	3 (4; 2-5)	4 (3; 2-5)	2 (4; 1-6)	2 (0,5; 1-2)
Ventilation duration in days median (SD; IQR)	15 (11; 7-24)	16 (12; 8-26)	14 (13; 5-25)	12 (9; 7-21)	14 (3; 13-15)
LOS ICU median days (SD; IQR)	8 (16; 5-20)	8 (17; 5-21)	7 (18; 5-22)	9 (14; 3-18)	6 (9; 3-12)
LOS Hospital median days (IQR)	17 (18; 11-27)	16 (20; 10-34)	16 (15; 12-21)	22 (21; 14-27)	18 (11; 14-27)
HRQL pre morbid conditions median (STDEV;IQR)	90 (12; 78-90)	90 (11; 80-90)	85 (13; 75-99)	85 (13; 80-90)	90 (8; 86-90)
HRQL post ICU median (STDEV; IQR)	70 (20; 50-80)	70 (19; 60-80)	60 (22; 50-83)	70 (21; 65-80)	65 (21; 50-70)
P-value delta HRQL (paired t test)	<0.05	<0.05	<0.05	<0.05	0.12
HRQL patients in follow up	61 patients	29 patients	19 patients	9 patients	4 patients

octogenarians, LOS appears shorter, however, this may be due to increased mortality. Overall survival rate was 79%. Highest survival rate was observed in patients younger than 65 yo, while in patients older than 80 yo survival was only 50%. During ICU stay, 36 patients had therapy restrictions imposed after multidisciplinary consultation with at least 3 intensive care physicians and a respiratory medicine physician or gerontologist (if patient older than 70yo). 2 patients had 'do not resuscitate score' and 20 patients had limitations on renal replacement therapy or invasive mechanical ventilation. 10 patients deceased after withdrawal of care due to futility. In the latter group, 3 patients were younger than 75 yo while 7 others were older.

Of the 77 survivors who were contacted 2 to 3 months after discharge, 61 patients responded. All age groups reported a good premorbid HRQoL with an overall median score of 90 (IQR 78-90). The median HRQoL score after critical illness was 70 (IQR 50-80). A similar drop in HRQoL was seen in all age groups, however, due to the small number of octogenarians, the drop in this age group was not statistical significant (p 0.12).

Patient baseline characteristics, survival rates, ventilation strategy/duration, the length of stay and HRQoL are shown in table 1.

HRQL according to the age of 70 years old

In this patient population, we observed a high score in the premorbid self-reported HRQoL in both patients younger and older than 70 years old. There is no statistical significant difference in any domain of the EQ-5D between the these age groups. Both age groups showed a lower self-reported HRQoL after COVID-19 critical illness. Disaggregating the EQ-5D by domain, we found that anxiety/depression was more common in the age group below 70 years old in which 13 of 35 patients (37%) suffered moderate to severe anxiety/depression. In the age group above 70 yo only 2 of the 22 patients (9%) felt moderately to severely depressed (Table 2, Fig. 2). This difference was proven statistical significant (p <0,05). Nobody felt extremely depressed, therefore score 5 (extreme anxiety/depression) is not shown in table 2 and figure 2.

Table 2

Anxiety/depression post ICU

Count Total % Col % Row %	1	2	3	4	Total
70+	14 24,56 46,67 63,64	6 10,53 50,00 27,27	0 0,00 0,00 0,00	2 3,51 40,00 9,09	22 38,60
no 70+	16 28,07 53,33 45,71	6 10,53 50,00 17,14	10 17,54 100,00 28,57	3 5,26 60,00 8,57	35 61,40
Total	30 52,63	12 21,05	10 17,54	5 8,77	57

Anxious or depressed: 1: not 2: slightly 3: moderate 4: severe 5: extremely.

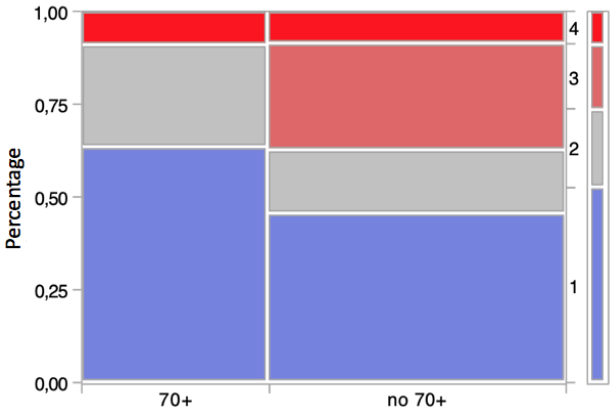

Fig. 2. — Mosaic plot anxiety/depression post ICU percentage.

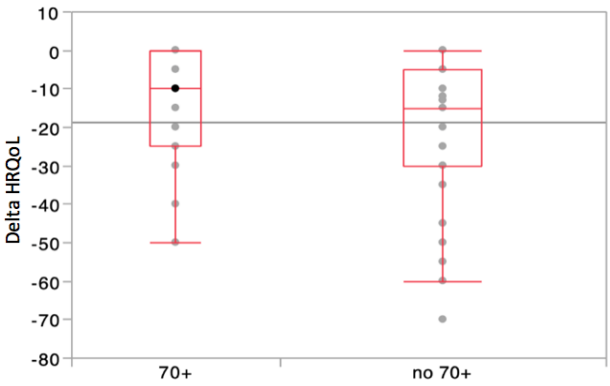

Fig. 3. — Delta HRQoL pre-post ICU according to age.

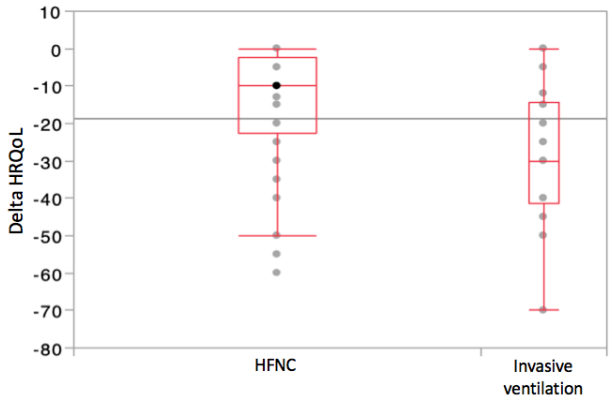

Fig. 4. — Delta HRQoL pre-post ICU according to ventilation strategy.

The overall self-reported HRQoL 2 to 3 months after discharge from the ICU was not statistically different between both age groups. The median drop in HRQoL in the younger age group was 15 points while the median drop in the older age group was 10 points (Fig. 3).

Invasive mechanical ventilation and HRQoL

A total of 39 patients received invasive mechanical ventilation for refractory hypoxemic respiratory failure. 18 patients were younger than 70 years old and 21 were older. Median duration of invasive ventilation was 14 days (IQR 6-23) in the group of patients older than 70 years old. In the patient group under 70 years old, median duration of invasive ventilation was 16 days (IQR 7-26). In mechanically ventilated patients, the median drop in HRQoL was 30 points. This is statistically different in comparison to patients treated with HFNC only, where the median drop was only 10 points ($p < 0.05$) (Fig. 4).

Discussion

Key findings and relationship to previous studies

The high quality of healthcare and care for the aged in the industrialized nations has led to an increasing proportion of elderly patients that may need intensive care at some point. As the elderly are at greater risk of a complicated course in COVID-19, this pandemic posed considerable medical and ethical challenges for our overwhelmed health care systems.

In this retrospective study, patient characteristics, outcomes and HRQoL scores were analyzed in different age groups. Although older patients had higher CCI and APACHE IV predicted mortality scores, frailty scores were comparable. This score was frequently used as a clinical decision tool to decide whether a patient would benefit from critical care (12). However, even with similar frailty scores, older patients had higher mortality rates. Octogenarians had a survival rate of only 50%. Given the high mortality rates in the very old -a trend also seen in other studies (4-6) patients above the age of 80 years were very rarely intubated. In contrast to other countries, the higher mortality did not withhold elderly patients to be admitted to the critical care department in our hospital: almost 15% of the ICU patients were octogenarians. In Great Britain, only 2.6% of patients with COVID-19 being treated in ICU were ≥80 years old (16).

The overall mortality rate among patients with COVID-19 in our cohort was 21% which is slightly better than the ICU mortality rate of 30.6% seen in other hospitals in the same period (17). Besides patient characteristics and outcomes, HRQoL scores were collected in the ICU survivors. As previous studies (18-22) have already reported HRQoL after COVID-19 critical illness, this study adds extra data and is unique in comparing the change in self-reported HRQoL score before and after ICU admission between the age groups above and below 70 years old. The median overall drop in self-reported HRQoL is 20 points (table 1), which is little less than the drop of 26 points seen in the study of Taboada et al. (23). This study reported the EQ-5D index of 91 ICU survivors before and 6 months after COVID-19 associated ARDS and showed that advanced age, male sex, mechanical ventilation/duration, length of ICU and hospital stay were associated with a decreased quality of life, decreased functional status or both.

In contrast to Taboada's findings, our study showed that there is no correlation between advanced age and decreased self-reported HRQoL. As shown

in figure 3, the change in HRQoL in the group above 70 years old was similar to the younger group. Moreover the only statistical significant difference seen in HRQoL is that younger patients suffered more from anxiety/depression after COVID-19 critical illness (Fig. 2).

Strengths and limitations of the study

This study makes it possible to compare patient characteristics, outcome and self-reported HRQoL between younger and older patients with COVID-19-associated ARDS. A decline in functional outcome and HRQoL after ARDS was already seen in previous studies before the COVID-19 pandemic (24-26). Nevertheless our study is one of the first to show that the drop in self-reported HRQoL score after COVID-19 critical illness is not necessarily linked to age when critical care is given to selected elderly patients.

A first limitation of the present study is it's retrospective design with a small number of patients. A second limitation is the fact that premorbid self-reported quality of life is being assessed after discharge from the intensive care unit. Although the accuracy of recalled health might be reasonable up to 3 months after hospital discharge (27), premorbid HRQoL may be overestimated by the individual patient. An identical phenomenon is true for HRQoL after discharge from ICU, where patients may be satisfied with their quality of life despite poor objective scores (28). Finally, the term of follow up reported here is rather short and should be prolonged with a 6 and 12 month follow up.

Conclusion

Despite higher mortality rates in elderly patients admitted to the ICU due to COVID-19 induced respiratory failure, the drop in HRQoL scores patients report after critical care admission is not affected by age. ICU clinicians should be aware of these findings and should look beyond crude ICU mortality and consider utilizing premorbid self-reported quality of life and frailty scores to estimate whether ICU admission adds value to the individual patients life.

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