

Poorer Outcomes after ICU Admission Correlate with Inappropriate Admission, Chronic Illness, and Lower Socioeconomic Status

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Background

The ICU is an important unit dedicated to keeping critically ill patients alive in the US. Yet despite its clear importance there is little in the way of regulation when it comes to comprehensive admittance guidelines. The influence of chronic illness and socioeconomic status both also play a key part in patient outcomes and thus in an attempt to determine the relationship between these elements a review of the literature was performed.

Inappropriate Admission

No official ICU guidelines for many countries. The US, in particular, suffers from this issue due to hospitals sporting different criteria based on location, resources, and hospital systems. The US has about 580 health systems, which vary in size.

- This leads to admissions for vague/inconsistent reasons, as well as providing patient's futile care.

Due to the nature of medicine, criteria for ICU admission tend to be rather broad, though efforts to be more conservative with ICU beds have been made

Long-term cognitive impairment (LTCI) is seen primarily in ICU patients and causes chronic dysfunction

- LTCI is associated with new or worsening issues involving memory, mental processing speed, intellectual function, and more and lasts for over a year. Approx. 42-52% of ICU patients over 65 will likely suffer from LTCI; it's anticipated that LTCIs could negatively affect 60% of patients' ability to perform daily activities for up to 8 years after admission.
- Severe LTCI is comparable to mild to moderate Alzheimer's dementia and prevents patients from returning to baseline

Chronic Illness

Heart disease, cancer, stroke, COPD (chronic obstructive pulmonary disease), and diabetes are responsible for seven out of ten deaths in the US

- Patients with chronic illnesses such as diabetes, cancer, and congestive heart failure are also noted to have increased odds of developing LTCI, with the suggested 15% of older ICU survivors having a new dementia diagnosis three years after follow-up

In the United States, an estimated 65% of people 65 and older have at least two chronic conditions

- Numerous chronic diseases, notably cancer, diabetes, hypertension, heart disease, and respiratory disease, can lead to hospitalisation and poor health outcomes overall, and persistent conditions are the leading cause of both death and disability in the US

Social Bias

Research shows that women have a significantly higher chance of being hospitalised for asthma, while men have a higher mortality rate from COPD, diabetes, chronic kidney and other conditions

Non-Hispanic blacks have a higher mortality rate for pulmonary disease, diabetes, and asthma and were followed by Pacific Islanders and Native Americans

- Black and Hispanic people were less likely to engage in preventive health compared to other races, leading to likely poor health outcomes

An increase in the lack of insurance is associated with an increase in hospitalisation for chronic pulmonary disease

Adults with higher SES are more likely to have grown up in homes with more resources, better nutrition, and safer neighbourhoods and to have a greater ability to access health services

- Evidence strongly suggests that socioeconomic status is linked to the likelihood of having major diseases, with the exception of cancer negatively.
- Those with less education almost always experience increased amounts of disease, though those with higher education are more likely to survive cancer

Level of Care	Priority	Type of Patient
ICU	Priority 1	Critically ill patients who require life support for organ failure, intensive monitoring, and therapies only provided in the ICU environment. Life support includes invasive ventilation, continuous renal replacement therapies, invasive hemodynamic monitoring to direct aggressive hemodynamic interventions, extracorporeal membrane oxygenation, intra-aortic balloon pumps, and other situations requiring critical care (e.g., patients with severe hypoxemia or in shock)
	Priority 2	Patients, as described above, with significantly lower probability of recovery and who would like to receive intensive care therapies but not cardiopulmonary resuscitation in case of cardiac arrest (e.g., patients with metastatic cancer and respiratory failure secondary to pneumonia or in septic shock requiring vasopressors)
IMU	Priority 3	Patients with organ dysfunction who require intensive monitoring and/or therapies (e.g., noninvasive ventilation), or who, in the clinical opinion of the treating physician, could be managed at a lower level of care than the ICU (e.g., postoperative patients who require close monitoring for risk of deterioration or require intense postoperative care, patients with respiratory insufficiency tolerating intermittent noninvasive ventilation). These patients may need to be admitted to the ICU if early management fails to prevent deterioration or there is no IMU capability in the hospital
	Priority 4	Patients, as described above but with lower probability of recovery/survival (e.g., patients with underlying metastatic disease) who do not want to be intubated or resuscitated. As above, if the hospital does not have IMU capability, these patients could be considered for ICU in special circumstances
Palliative care	Priority 5	Terminal or moribund patients with no possibility of recovery; such patients are in general not appropriate for ICU admission (unless they are potential organ donors). In cases in which individuals have unequivocally declined intensive care therapies or have irreversible processes such as metastatic cancer with no additional chemotherapy or radiation therapy options, palliative care should be initially offered

Figure 1. ICU Admission Prioritization Framework (Nates et al. 2016).

Similarities

Despite differences in presentation, Fig 1 alludes to the information presented in Fig 2 (hemodynamic stability, hypoxemia, etc).

Differences

Much more text dedicated to explaining specifics of ICU criteria (Fig 1.) versus outlining actual criteria in terms of vitals or lab results (Fig 2.).

Figure 1. elaborates on higher levels of care, whereas the guidelines in Fig 2. are specifically for ICU admission.

Fig 1. Creates different levels of priority for admission.

Criteria	Undifferentiated patients		Specific population	
	Most liberal threshold ^a	Most conservative threshold ^b	Most liberal threshold ^a (population)	Most conservative threshold ^b (population)
GCS	<9	<15	<9 (TBI, stroke)	<15 (TBI)
Hypertension (mmHg)	DBP > 120	SBP > 170	SBP > 220 (stroke)	SBP > 185 (stroke post-thrombolysis)
Hypotension (mmHg)	SBP < 80	SBP < 90	SBP < 90 (stroke)	SBP < 100 (GI bleed)
Tachycardia (HR)	> 150	> 120	> 130 (age > 60)	> 110 (COVID-19)
Bradycardia (HR)	< 40	< 40	< 40 (heart failure)	< 40 (heart failure)
Arterial oxygen saturation	≤ 90% on ≥ 0.6 FiO ₂	< 90%	< 85% (COVID-19)	< 93% on room air (delivery suite)
PaO ₂ /FiO ₂	< 83	< 140	< 150 on CPAP (COVID-19)	< 300 (COVID-19)
PaCO ₂ (mmHg)	≥ 60	> 45 if [pH] < 7.35	> 40 (asthma)	> 38 (delivery suite)
Tachypnoea (RR)	≥ 40	> 30	≥ 30 (COVID-19, CAP)	> 20 (delivery suite)
Hypothermia (T, °C)	< 32	< 34	< 35 (DKA)	< 36 (CAP)
Acidaemia ([pH])	< 7.1	< 7.2	-	-
Hyperkalaemia ([K], mmol/L)	> 7	> 5.5 + arrhythmia	> 7 (age > 80)	-
Hyponatraemia ([Na], mmol/L)	< 110	< 130	< 110 (age > 80)	-

Figure 2. Range of thresholds for most frequently described physiological-based admission criteria. (Soares et al. 2024).

How does it all connect?

Chronic illness, inappropriate admission, and multiple socioeconomic factors can all lead to poorer health outcomes and increased mortality. Lower socioeconomic status can "be inherited" from parents and even leads to chronic illness in youth. While chronic illness also feeds into financial issues, the effects of socioeconomic factors do lessen over time. However, this, in turn, increases the risk of multi-morbidity as one ages. Multi-morbidity is associated with even worse health outcomes and more debt, and as patients age into the very elderly region, they have a higher likelihood of receiving futile care and having worse health outcomes in the ICU.

Future Directions

Numerous steps should be taken to combat the issues presented above, however 3 critical steps to take would be:

- Clearer overarching guidelines for the nation
- ICU recovery centers to prevent readmission and treat chronic illnesses
- Further research into how SEC affects health
 - Income inequality and its effects on health at a local, regional, and societal levels

Method

A comprehensive literature review utilizing 45 sources was performed during the TBIOMD 492: Critical Reading In Biomedical Sciences Literature course. Information on the interplay between the elements listed above were gathered through google scholar. These included primary, secondary, and even government sources from Europe, North America, and India.

References

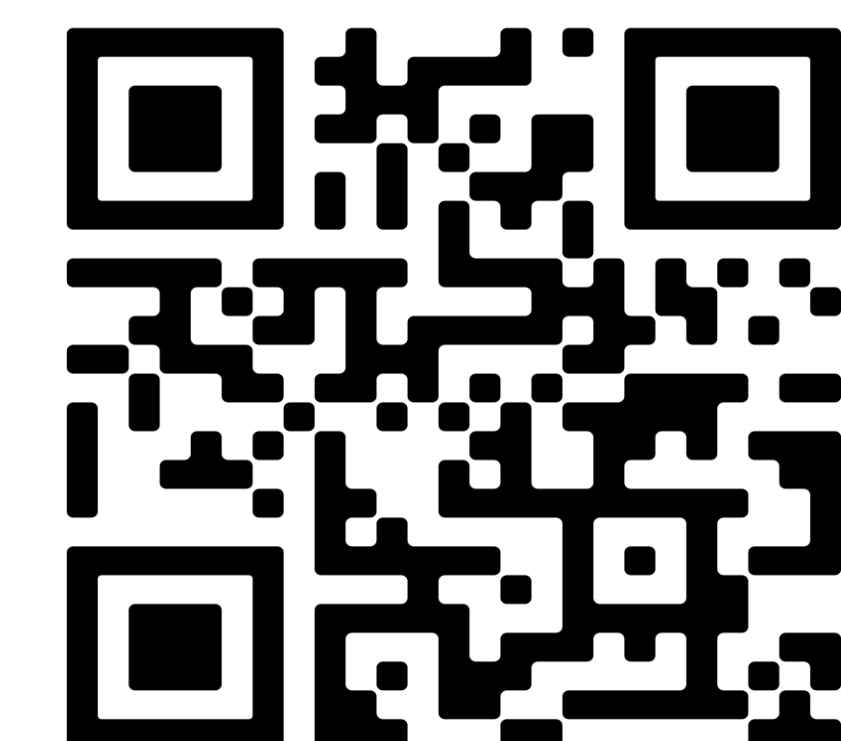


Figure A. Two graphs which compare guidelines made by different researchers. On top, the graph produced by Nates et al. On bottom a graph made by Soares et al. Top left shows comparison of the two figures.