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Has survival increased in cancer patients admitted to the ICU? Yes

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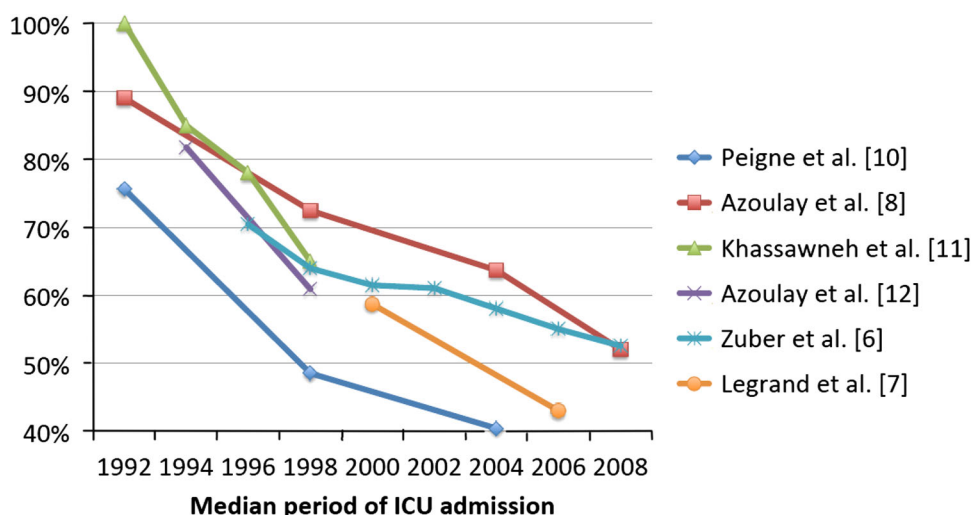
Intensive care unit (ICU) admission of patients with cancer has long been controversial. Studies performed in the early 1990s demonstrated high mortality rates in cancer patients admitted to the ICU, especially among those with respiratory failure requiring mechanical ventilation, neutropenic sepsis, and in hematopoietic stem cell transplant (HSCT) recipients [1, 2]. Additionally, a

lack of cost-effectiveness was noted and some authors argued that denial of ICU admission could avoid futile care and unwarranted aggressive therapy in dying patients [3, 4].

Over the past decade, however, studies that report prognosis and predictive factors for mortality in critically ill cancer patients have shown different results [5–10]. Although mortality remains high when compared to the general population of critically ill patients, these studies have demonstrated meaningful ICU and hospital survival rates and some of them improved survival over time [5–8]. Unadjusted ICU and hospital mortality rates have been found to decrease progressively [9]. However, these findings were mainly reported by single center cohort studies and usually involved a small number of patients [9]. A recent, prospective multicenter study of 1,011 critically ill patients with hematological malignancies [5] reported encouraging hospital, 90-day, and 1-year survival rates of 60.7, 52.5, and 43.3 %, respectively compared with the poor outcomes reported 15–20 years ago [1, 2, 5, 9]. Similarly, although hospital mortality remained high in those patients requiring mechanical ventilation (60.5 %), this mortality rate is significantly lower than the over 90 % mortality rates in mechanically ventilated cancer patients that were earlier reported [1, 2, 5]. Recent studies have also confirmed that complete or partial remission of the underlying disease, lack of comorbidities, and good performance status are associated with increased risk of survival whereas some of the usual prognostic factors such as neutropenia failed to be associated with adverse outcomes [5, 6, 10].

Improved survival has also been demonstrated in subgroups of critically ill cancer patients including those with neutropenic sepsis [7], myeloma patients [10], and to a lesser extent in HSCT recipients [11]. Similarly, the outcome of cancer patients admitted to the ICU with severe sepsis or septic shock [6], acute respiratory distress syndrome (ARDS) [8], or those requiring mechanical

Fig. 1 Sequential change in hospital mortality according to median period of ICU admission in critically ill cancer patients [6–8, 10–12]



ventilation [12] has also improved steadily in recent years. When examined over time, these studies have reported a significant reduction in the absolute risk of hospital mortality ranging from 15 to 50 % between the early/mid-1990s and the past decade (Fig. 1) [6–8, 10, 12].

Several factors may explain this apparent prognostic improvement. First, the overall prognosis of patients with hematological or solid malignancies has improved steadily perhaps as a result of both new and more effective anticancer treatments and advances in supportive care [13, 14]. The former include targeted therapy such as anti-CD20 agents, tyrosine kinase inhibitors, and anti-vascular endothelial growth factor (VEGF) agents while the latter include the use of prophylactic colony-stimulating factors to decrease the duration of neutropenia and neutropenia-related adverse events, and the availability of highly effective antifungal agents. Alongside this progress, the prognosis of the general population of critically ill patients has also improved which may have also influenced the outcome of cancer patients [15]. Finally, the population of cancer patients admitted to the ICU has evolved recently with many patients being admitted earlier [10] and who may be less critically ill at ICU admission or may have an acute disease process that is more likely to be treatable [5, 7, 8]. In addition, ICU admission policies have changed and patients admitted in recent years are less likely to have severe comorbidities or poor performance status [10]. Although these factors may

partly explain the observed improvements in outcome, it must be noted that several of the previously described studies demonstrated the time-related increase in survival of critically ill cancer patients to be independent from these confounding factors [7, 8].

In summary, while these results are encouraging, several uncertainties remain. First, conflicting evidence exists regarding the quality of life of ICU cancer survivors. A recent multicenter study suggested that the quality of life 90 days after ICU discharge in cancer patients was good and similar to age- and gender-matched cancer patients who did not require ICU admission [5]. In contrast, a previous study of critically ill cancer patients reported a profound alteration in quality of life up to 1 year following ICU admission [16]. The overall long-term survival of cancer patients after ICU discharge also remains largely unknown. Prior studies that suggested cost concerns for admitting cancer patients to the ICU still need to be reexamined [3]. Lastly, the impact of early ICU admission on survival awaits further study. Despite these remaining uncertainties, the latest studies have demonstrated increased and meaningful survival in cancer patients admitted to the ICU. These findings suggest that the general reluctance of intensivists to admit these patients to the ICU is no longer justified.

Conflicts of interest None of the authors has any conflicts of interest to declare.

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