

Which oncology patients should we admit to ICU?

Clinical problem and domain

I selected this case because there is often pessimism from the Intensive Care team about admitting oncology patients. I wanted to use this case to determine the factors associated with a positive outcome in oncology patients admitted to the Intensive Care Unit (ICU) to ensure that I can encourage admission of appropriate patients without excluding those who are likely to benefit.

A 71 year-old gentleman with a testicular seminoma with para-aortic lymph node spread was admitted to the oncology ward with a 2 day history of nausea and vomiting. His malignancy had been detected incidentally just 6 weeks previously on imaging for his abdominal aortic aneurysm. He had undergone a successful endovascular aneurysm repair (EVAR) and was undergoing treatment with curative intent. He was on atenolol for hypertension but had a good functional status and continued to run his own business. He was due to receive 4 cycles of etoposide cisplatin, followed by possible radiotherapy and then an orchidectomy. He had received his first cycle of chemotherapy the previous week. He was noted to be hypotensive in the oncology ward with an acute kidney injury and a haemoglobin of 71g/l, neutrophils of $0 \times 10^9/l$, a platelet count of $13 \times 10^9/l$ and a prothombin time ratio of 4. He was commenced on intravenous antibiotics and transferred to the medical high dependency unit (HDU).

225 words

Management

In HDU, he was drowsy, with SpO₂ of 95% on 15 litres of oxygen via a non-rebreathe mask, a respiratory rate of 26, a heart rate of 103, non-invasive blood pressure of 70/40mmHg, and cool peripheries. He was resuscitated with 2.5 litres of crystalloid, 1 litre of 5% albumin, 2 units of red cells and 2 units of fresh frozen plasma. Arterial and central lines were inserted and noradrenaline was commenced. He was then transferred to ICU for further management of neutopenic sepsis leading to septic shock.

In ICU, a hydrocortisone infusion was added for septic shock, broad-spectrum antibiotics were continued and cardiac output monitoring (Lithium Dilution Cardiac Output) was instituted. Vasopressin was added to combat his low systemic vascular resistance index (SVRI). He was commenced on granisetron for nausea and a septic screen was sent to try and identify the source of sepsis. He received regular reviews from the oncology team and lenograstim was added as his neutrophils were not improving.

He remained unintubated and was achieving a satisfactory blood pressure on noradrenaline and vasopressin, but developed worsening acute kidney, attributed to dehydration, chemotherapy and hypoperfusion. Over the course of the next day he developed acute liver failure with worsening coagulopathy, deranged liver function tests and hypoglycaemia and a worsening metabolic acidosis and increasing lactate despite vasopressors and fluid resuscitation. He also had new generalised abdominal tenderness, absent bowel sounds, and a high output of dark green fluid from his nasogastric tube. Intra-abdominal sepsis was thought to be likely, however he was too unstable to transfer to CT and in the event of a positive finding, unsuitable for surgery. Following discussion with the renal and oncology teams, he was commenced on Sustained Low Efficiency Dialysis (SLED) with the aim of reducing his acidosis.

Over the course of the evening, he continued to deteriorate. He developed atrial fibrillation and had increasing oxygen requirements necessitating the use of non-invasive ventilation. By the third day of admission, his oxygen requirements had lessened but his lactate continued to rise. He had circulatory, renal, respiratory, hepatic and haematological failure despite aggressive management. Following discussion with his family and the oncology and renal teams involved in his care, the decision was made to move towards palliative care and he died in the presence of his family.

387 words

Discussion

A diagnosis of malignancy has previously been a reason for many intensive care physicians to refuse ICU admission.^{1,2} However, approximately 15% of patients admitted to ICUs in Europe have a diagnosis of malignancy and these physicians may be excluding patients who could benefit from ICU care.³ Previous work by Thiéry *et al* found that intensivists are poor at identifying appropriate oncology patients for admission to ICU.⁴ Of 206 patients considered for ICU admission, approximately half were declined because they were either “too well” or “too sick”. Thirty-day survival of these patients showed that 79% of the “too well” patients survived. Perhaps more concerning, 26% of those who were “too sick” survived. This suggests that some patients who may have benefited from ICU were excluded.

There has been a significant improvement in mortality rates in cancer patients over the past few decades. Indeed overall mortality has reduced by 20% between 1978 and 1998.⁵ This is likely due to recent advances in oncology management, including more intensive chemotherapy treatment, more aggressive surgical and radiotherapy management, and improved management of treatment-related complications.⁶ This increases the requirement for critical care input for these patients.^{2,3} Approximately 1 in 20 patients experience a critical illness leading to ICU admission within 2 years of cancer diagnosis.⁷

Although the outlook was likely to be poor in our patient’s case, he was admitted to ICU because he had a good functional status and a potentially reversible cause. Intensive care support is generally offered only when the likelihood of survival is reasonable. However, it may not always be prudent to provide organ support in cases of reversible illness on a background of terminal illness, and perhaps care at the end of a patient’s life should focus on quality of life rather than prolonging it.² We must therefore be able to determine which patients are likely to benefit from ICU care and those in whom the risks of ICU outweigh the benefits. The British Committee for Standards in Haematology have recently published a helpful guideline on ICU management and admission of patients with haematological malignancy, but no such guideline exists for patients with solid organ tumours.⁸

Mortality rates of oncology patients admitted to ICU

Puxty *et al* performed a systematic literature review of solid cancers in adult patients admitted to ICU from 2000 onwards. Reported ICU mortality varied from 4.5-85% with an average of 31.2% (95% confidence interval 24-39%). This is based on a sample of 25 339 patients. Hospital mortality ranged from 4.6-76.8% with an average of 38.2% (95% confidence interval 33.8-42.7%). This is based on a sample of 74 061 patients. Only 1 study reported 5-year survival (62.8%).²

Predictors of survival

Increased mortality is associated with poorer physiological status, requirement for invasive mechanical ventilation, and poor World Health Organisation (WHO) performance status (scores 3 and 4).² It is difficult to compare physiological status between studies because of the variety of scoring systems employed. Puxty *et al* reported that sepsis increased ICU mortality fivefold, and mechanical ventilation increased it by sixfold. Poorer performance status was associated with a four- to sevenfold increase in ICU mortality. Vasopressor use increased the risks of both ICU and hospital mortality. Patients admitted as medical (rather than surgical) had an increased risk of both ICU and hospital mortality.² Studies reporting an association between metastatic disease and ICU or hospital mortality had conflicting results. Most of this data comes from retrospective studies and so is limited by selection bias.¹ Interestingly, leucopenia and neutropenia were not reported to be linked to short-term mortality.²

The risk of oncology patients dying in ICU appears to increase with an increasing number of failing organs, which also occurs in patients with non-malignant disease.^{1,3} However, mortality is higher (75%) for cancer patients with more than 3 organs failing than for patients without cancer with the same number of organs failing (50%). Respiratory failure is associated with the highest rate of death.³

Mortality for specific tumour sites

Survival varies between cancer site and also between studies of the same cancer site. Patients with lung cancer generally had the highest ICU mortality rates (average 40.1%), and those with gynaecological cancers had the lowest (average 12%). There were significantly more studies reporting lung cancer ICU mortality rates than other cancers.²

Most studies on ICU mortality rates of oncology patients are heterogenous in terms of patient characteristics, definitions of ICUs, and treatment provided, so it is difficult to generalise results.^{2,9} Many of them were undertaken in tertiary cancer centre ICUs, so extrapolation to the general ICU is also difficult.³ Further research should therefore specify definitions of ICU care, type of ICU, and admission criteria clearly to allow comparison between studies.² There is little evidence on longterm survival of cancer patients admitted to ICU. Further research is required to determine whether increased survival is associated with improved quality of life or whether it is simply prolongation of the dying phase.⁹

842 words

Lessons learnt

I have learned that the ICU and hospital mortality for cancer patients is now significantly lower than has been previously reported, and patients should not be refused ICU admission solely on the basis of a diagnosis of malignancy.¹⁰ It is more sensible to take into account the severity of the acute illness and bear in mind the factors associated with survival when making a decision about ICU admissions in this population.^{1,2} In patients outwith the palliative phase of their illness, a trial of ICU with reassessment of the benefits after several days of optimal support may be worthwhile to avoid futile use of scarce resources whilst also avoiding exclusion of patients that may benefit.^{1,4,9} Reviewing the literature has reinforced my belief that patients with cancer are a heterogeneous population and that decisions about ICU admission should be made on an informed and individual basis.

147 words

Total 1601 words

References

1. McGrath S, Chatterjee F, Whiteley C, Ostermann M. ICU and 6-month outcome of oncology patients in the intensive care unit. *Quarterly Journal of Medicine* 2010; 103: 397-403
2. Puxty K, McLoone P, Quasim T, Kinsella J, Morrison D. Survival in solid cancer patients following intensive care unit admission. *Intensive Care Medicine* 2014; 40 (10): 1409-28
3. Taccone FS, Artigas AA, Sprung CL, Moreno R, Sakr Y, Vincent J-L. Characteristics and outcomes of cancer patients in European ICUs. *Critical Care* 2009; 13 (1): R15. Available online at <http://ccforum.com/content/13/1/R15>
4. Thiéry G, Azoulay A, Darmon M, Ciroldi M, De Miranda S, Lévy V, Fieux F, Moreau D, Le Gall JR, Schlemmer B. Outcome of cancer patients considered for intensive care unit admission: a hospital-wide prospective study. *Clinical Oncology* 2005;23 (19): 4406-13
5. Brenner H. Long term survival of cancer patients achieved by the end of the 20th century: a period analysis. *Lancet* 2002; 360: 1131-5
6. Parakh S, Piggan A, Neeman T, Mitchell I, Crispin P, Davis A. Outcomes of haematology/oncology patients admitted to intensive care unit at The Canberra Hospital. *Internal Medicine Journal* 2014; 44 (11): 1087-94
7. Puxty K, McLoone P, Quasim T, Sloan B, Kinsella J, Morrison DS. Risk of critical illness among patients with solid cancers: a population-based observational study. *JAMA Oncology* 2015; 1 (8): 1078-85
8. Wise MP, Barnes RA, Baudouin SV, Howell D, Lyttelton M, Marks DI, Morris EC, Parry-Jones N. Guidelines on the management and admission to intensive care of critically ill adult patients with haematological malignancy in the UK. *British Journal of Haematology* 2015; 171: 179-88
9. Azoulay E, Soares M, Darmon M, Benoit D, Pastores S, Afessa B. Intensive care of the cancer patient: recent achievements and remaining challenges. *Annals of Intensive Care* 2011; 1 (1): 5-17
10. Staudinger T, Stoiser B, Müllner M, Locker GJ, Laczika K, Knapp S, Burgmann H, Wilfing A, Kofler J, Thalhammer F, Frass M. Outcome and prognostic factors in critically ill cancer patients admitted to the intensive care unit. *Critical Care Medicine* 2000; 28 (5): 1322-8