

PAEDIATRIC INTENSIVE CARE ADMISSIONS IN CHILDREN WITH ACUTE LYMPHOBLASTIC LEUKAEMIA

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INTRODUCTION

The outcomes for children with acute lymphoblastic leukaemia (ALL) are steadily improving, with cure rates of over 93%. However, treatment-related mortality is still significant; infection being the leading cause of morbidity and mortality in these immunocompromised patients. Children with ALL who suffer from disease or treatment complications may require escalation of care to the paediatric intensive care unit (PICU). ALL represents the most common underlying malignancy in children admitted to PICU¹. Patients with haematological malignancies are at higher risk of mortality in PICU².

AIM

To identify the main reasons for children with ALL to be admitted to PICU and review the impact of these episodes on morbidity and mortality.

To describe patients in particular risk of requiring intensive care and higher risk for mortality in the intensive care unit.

To describe the duration of PICU episodes and the phase of treatment at which they happen.

RESULTS

Over the 13 year study period, approximately 450 under 16s were treated for ALL in the study center, and 67 (15%) of these had at least one PICU admission (84 admissions in total). Fifty-three patients had one PICU admission and fourteen had more than one; over half of second admissions occurring within a month of the previous PICU discharge. Infection was associated with 61 (73%) PICU admissions. The most common causes for admission were sepsis (22/84), respiratory infection (16/84), and respiratory failure (13/84). The mean length of stay for patients with infection was 8.9 days compared to 3.9 days in patients without an infective primary cause for admission to PICU.

Complete treatment information was available for fifty-eight patients. Of these, nine patients had relapsed disease (11 admissions), three were infants (10 admissions), two had Philadelphia positive ALL (3 admissions), and two had had a hematopoietic stem cell transplantation (3 admissions). In the remaining forty-two patients, there were 49 PICU admissions: 27/49 in induction, 4/49 in consolidation, 7/49 in delayed intensification, and 11/49 in maintenance. Of the total 84 admissions, 49 admissions required ventilation, 73% of which were due to infection. In 45 of the admissions the patient required inotropic support; 80% of these admissions were secondary to infection. Twenty of the patients who died were ventilated, eleven of those were also on inotropic support.

There were twenty-two deaths within the first 30 days from discharge from PICU. Seven of those deaths were in patients with relapsed disease. Patients who died in PICU had shorter admissions with a mean duration of 5 days. The mortality rate for patients in PICU was 16 per 100 person-days at risk. Crude mortality rate ratio in patients at induction versus other phases was 3.5 p=0.05. The mortality rate was higher in those who were ventilated, however, only inotrope requirement reached statistical significance: crude rate ratio 3.5 p=0.03, increased to 4.6 p=0.02 controlling for ventilation status.

Primary reason for admission to PICU	Number of episodes
Sepsis	22
Respiratory infection	16
Respiratory failure	13
Acute organ failure	6
Neurological	6
Tumour lysis syndrome	4
Neurological infection	3
Bowel perforation	2
Electrolyte imbalance	2
GI bleed	2
HLH	2
Mediastinal mass	2
Infective endocarditis	1
Cardiac arrest	1
Suspected PTLD	1
Swollen epiglottis	1

Table 1: Primary reason for admission to PICU
(GI = Gastro-intestinal, HLH = Haemophagocytic lymphohistiocytosis, PTLD = Post-transplant lymphoproliferative disorder)

Treatment phase	Total no. of episodes	Mean no. of admission days for patients who survived	Mean no. of admission days for patients who died	No. of deaths	No. of infection related episodes	No. of deaths with infection
Induction	27 (55%)	5.5	2.1	6	16	4
Consolidation	4 (8%)	11.3	6	1	3	1
Interim maintenance	0	0	0	0	0	0
Delayed intensification	7 (14%)	8.8	8	2	6	1
Maintenance	11 (23%)	3.6	3.5	3	9	1
Total	49	7.3	4.9	12	34	7

Table 2: Overall description of PICU admissions per phase of treatment in patients with primary diagnosis of ALL

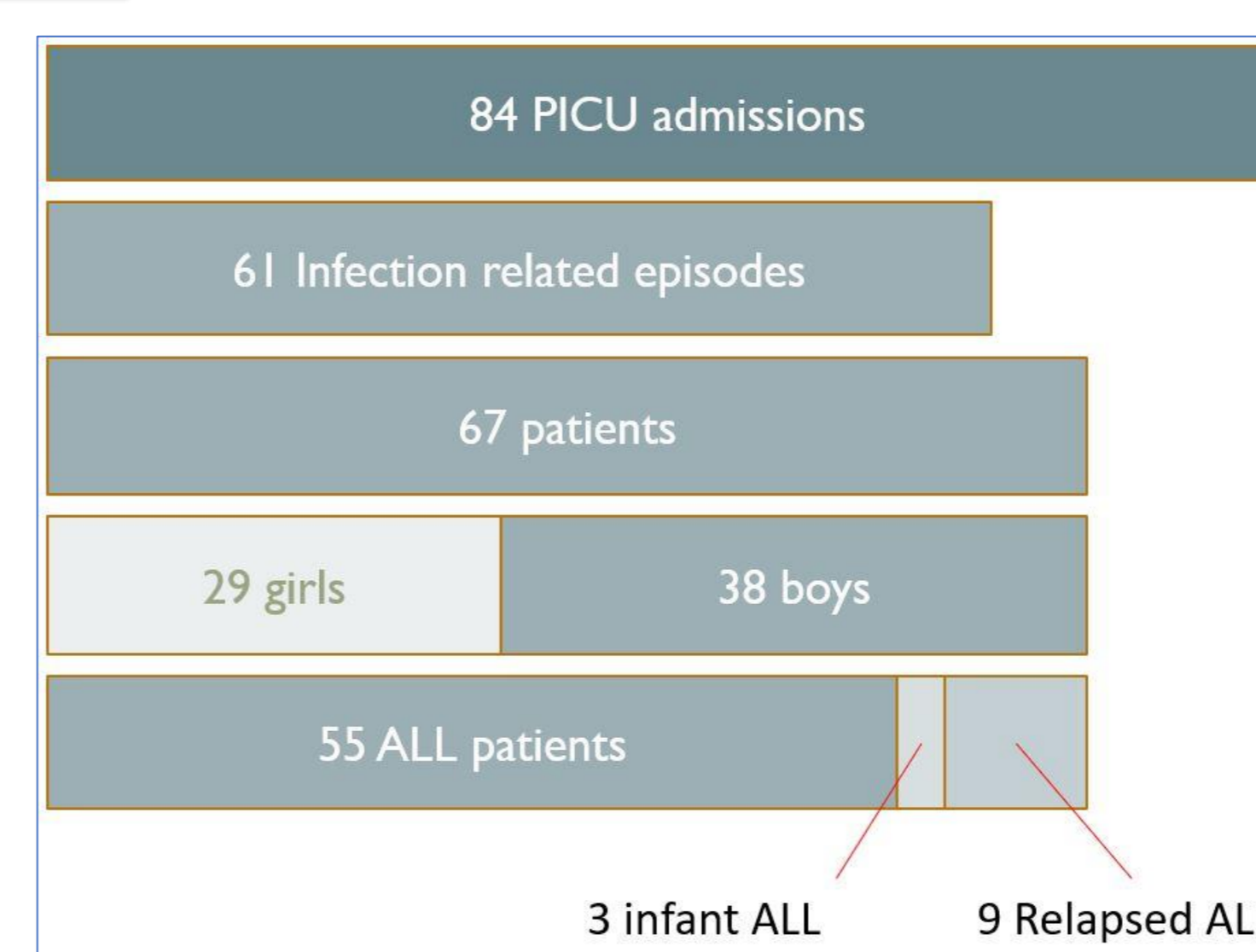


Figure 1: Patient characteristics

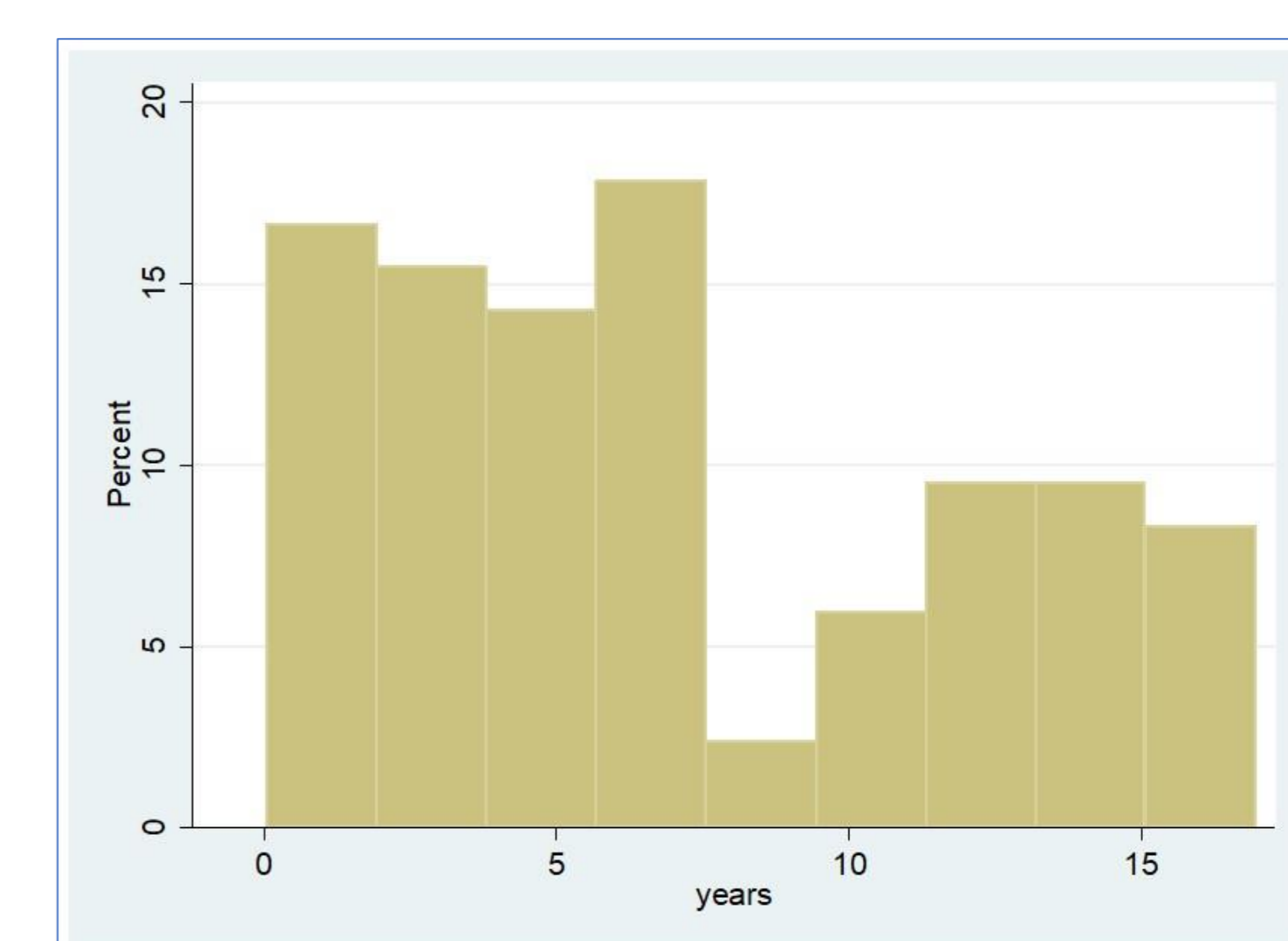


Figure 2: Age on admission to PICU

METHOD

Using patient records, we reviewed the PICU admissions and chemotherapy records of patients diagnosed with ALL under the age of 16 years in Leeds Children's Hospital over a 13 year period (June 2004- May 2017), regardless of trial participation.

Data collection included: age on admission, source, number and duration of admissions, re-admissions, primary diagnosis and treatment phase at the time of admission, level of care requirements (ventilation, inotropes), outcome (at discharge and 30 days post PICU discharge) and gravity of infection-related admissions.

CONCLUSIONS

Most admissions to PICU in this cohort of patients occurred during induction, the most intensive phase of treatment.

However, a significant number of admissions happened in maintenance treatment with 3 deaths in 11 PICU admissions during this phase.

Children with ALL who are admitted to PICU have poor outcomes; nearly 1 in 3 children died.

Patients with relapsed ALL are at particularly high risk of mortality in PICU (7/9).

Overall, infection was the main underlying reason for the requirement of intensive care in children with ALL.

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