

ELECTIVE (SSC5a) REPORT (1200 words)

A report that addresses the above four objectives should be written below. Your Elective/SSC supervisor will assess this.

Objective 1.

Of New Zealand's population of 4 million, there are four dominant ethnicities - Caucasian (72.9%), Maori (14.7%), Pacific Islanders (5.6%), and Asians (6.3%). Auckland is New Zealand's largest urban area with a population of 1,534,700 - this makes up 32% of the whole of New Zealand's population. The prevalence of haematological and malignant conditions are concentrated largely in New Zealand's main metropolitan city. In fact, Auckland houses the largest Polynesian population in the world. Since the mid-1960s, there has been a significant rise in incidences of acute lymphoblastic leukaemia diagnosed among young children. Whether causative or not, a high proportion of these diagnoses are made in the Polynesian population.

Management of haematological malignancies depend on chemotherapy protocols in clinical trials. There are no national guidelines, and because of the small population of 4 million, sensitive results cannot be made exclusively on national data. Management of malignancies at Starship are based on international collaborations, e.g., the Childhood Leukemia International Consortium and COG, Children's Oncology Group. Starship's haematology-oncology team study the different protocols peer-reviewed and choose those that are most cost-effective. Clinical work here collaborates closely with research that is implemented in the management and risk stratification of paediatric malignancies.

Indeed, Maori and Pacific Islanders are at an increased risk of acute myeloid leukemia and chronic myeloid leukaemia respectively. Many of those diagnosed are suitable for stem-cell transplantation - the gold standard in leukaemia treatment. The general challenge faced clinically with both ethnicity groups lies with the difficulty of finding a 6/6 HLA matched unrelated donor. Indeed, most donors on international registries are of Caucasian origin. Unfortunately, this means prognosis differs due to variable transplantation success among ethnic groups in New Zealand. Hematopoietic stem-cell transplants are potentially curative treatment options, but Maori and Pacific Islanders (who are incidentally at an increased relative risk of leukaemia) are disadvantaged by the limited accessibility to matched unrelated donors. Low transplant success rates in New Zealand consequently warrant improvement in the country's hematopoietic stem-cell transplant program.

During my time with the specialty, I developed a brief understanding of the use of allogeneic stem cell transplants at Starship Hospital and the use of various chemotherapy protocols. Long-term rounds of chemotherapy have a potentially devastating side-effect profile, including painful haemorrhagic cystitis, peripheral neuropathy, profound fatigue, and opportunistic infections. Furthermore, several of the patients are on an adjunct therapy of high-dose steroids, particularly after stem-cell transplant. Inevitably, this has psychological and physical adverse effects on the patient and their development during their childhood and teenage years. Many of the children on the ward are scheduled or have undergone bone marrow transplant. The wards with bone marrow transplant patients are filtered and de-humidified to deliver clean air to patients and prevent the transmission of opportunistic infections. A transplant is not a simple cure, and patients who undertake allogeneic stem cell transplant are at the increased risk of graft versus host disease, prolonging their hospital stay and risking further systemic and organ complications down the line.

Objective 2.

Haemophagocytic lymphohistiocytosis (HLH) is a haematological immunodeficiency disorder of T-cell and macrophage over-activity and dysfunction. It presents as cytopaenia, fever and end-organ dysfunction with possible central nervous system involvement - and should always be considered in young children systemically unwell with deranged LFTs. It is autosomal recessive and may thereby be related to parental consanguinity.

HLH is a predominantly paediatric disorder commonly affecting patients less than 3 months of age. Patients are usually started on toxic drugs, etoposide and ciclosporin, and high dose corticosteroids. During my 6-week medical elective, I came across a couple of cases of HLH, which were presented as case studies at the weekly departmental and leukaemia board meetings. It became obvious that due to the varied presentation of the disorder, HLH is classically under-diagnosed with undefined diagnostic criteria. Immediate treatment is life-saving if there is a high suspicion of HLH, since patients often present with rapid clinical deterioration. Of laboratory findings consistent with a diagnosis, patients should by textbook have 5 of the following: cytopenia, a high ferritin (median level of 3000 ng/ml); fever $\geq 38.5^{\circ}\text{C}$; splenomegaly; hypertriglyceridemia; hypofibrinogenemia; low or absent NK cell activity and elevated soluble CD25. The latter two are rarely investigated. A low ferritin does not exclude the possibility of HLH. Liver biopsy may indicate lymphocytic infiltration, and a bone marrow aspirate and biopsy should always be undertaken, although the incidence on bone marrow abnormality varies extensively and it is not a sensitive tool on its own.

Consequently, the barrier to a successful prognosis is the delay in diagnosis and prompt treatment, due to the variable presentation, and lack of specificity of clinical and laboratory investigations.

Objective 3.

I was actively involved in ward duties which helped in preparation for my upcoming role as a Foundation doctor. I assisted in clerking admissions with supervision, attending consultant-led ward rounds, with the expectation to write in medical notes and examine patients, wrote discharge summaries and presented patients at the weekly consultant handover meeting.

I saw many rare paediatric oncology cases. There was a 7-year old with an EBV-driven smooth cell brain tumour invading the occipital region, leading to frequent seizures and developmental delay. The management in this case is unclear, with trials of reducing immunosuppression before targeting cytotoxic T-cell lymphocytes. Another unique case was a 3-year old patient with large thrombus invasion of the IVC and right atrium secondary to hepatic neuroblastoma. During his admission, he was placed under trials of different anticoagulant regimens.

Oncology in paediatrics is certainly molecular, but there is also clear liaison with other specialities, particularly microbiology and infectious diseases (opportunistic infections are a constant risk secondary to drug-induced immunosuppression). Throughout my placement, I heard discussions on the growth of Cryptococcus in the brain of one patient, possible CMV infection and pseudomonas growth in intravenous peripheral and central lines. It is important to keep a close eye on temperatures spiking, particularly overnight, and be especially cautious in neutropenic patients post-chemotherapy (where the source of infection is more difficult to discern).

I witnessed a consultant give a new diagnosis of acute lymphoblastic leukaemia to a 16 year-old patient, requiring the doctor to give adequate information and education on what the diagnosis

means, and the chemotherapy that the patient would have to be started on. One patient I met was a 17-year old with a background of AML and liver GvHD. He was on regular tacrolimus and alternative days of prednisolone. Due to adverse complications from his transplant and long-term medication, he has had repeated month-long admissions. His case had a significant emotional impact on me, to see a young patient profoundly fatigued, displaying a constant flat affect, and deprived completely of his teenage years. The prednisolone was reduced on admission due to a significant cushingoid effect and the development of steroid-induced diabetes. This patient also suffered from haemorrhagic cystitis which was left unresolved following discharge. The psychosocial effects of long-term treatment for these conditions is obvious. A huge sense of empathy for these children became a running theme throughout my placement at Starship.

Objective 4.

There are psychosocial issues with children who are on the wards for months at a time. I felt empathetic towards some of the children who cannot go out and enjoy their childhood. One of the patients was a 17-year old with liver GvHD secondary to a allogenic stem cell transplant for AML. He told me he felt claustrophobic in his room, and his shower hadn't been working for the last few days. I visited him daily with the hope to put a smile on his face. I want to always remember to take into account one's mental well-being, and the psychological impact of being in hospital, when managing my own patients as a doctor. It was difficult to know who to talk to on issues important to children and teenagers, such as education, having fun and companionship, being able to lead a childhood. It seemed important to me that a child's long-term condition is no barrier to their future prospects, has no effect on their rights to the same opportunities and development as other children their age.

The life expectancy in New Zealand at birth is 80.2 years, six-months longer than the UK. There is a mixture of public and private sectors. Treatment for an accident is usually funded by the state. Similarly, emergency services are financially provided by public funds, donations and the charity St John NZ. However, patients pay for GP consultations and medications. These are usually subsidised for those with community health services cards or high-user health cards. Although public sectors are of good quality and free of charge to local citizens, long waits have led to a surge in the uptake of private healthcare insurance. Covering a quarter of the New Zealand population is the Southern Cross Health Insurance, a non-profit-scheme.