infection. Procalcitonin (PCT) is a novel marker that reflects the severity of infection. Allogeneic Hematopoietic Stem Cell Transplantation (Allo-HSCT) patients often have febrile episodes, but it is not easy to conclude that the fever is caused by infection. In this study, we assessed the diagnostic usefulness of PCT for allo-HSCT patients with fever.

Patients and Methods: We retrospectively analyzed among the 41 patients who underwent allo-HSCT at our hospital between January 2008 and July 2010, 17 patients with fever above 37.5°C and for whom PCT was measured (total of 28 febrile episodes). The number of cases of underlying hematologic diseases were as follows: 11 acute myeloid leukemia, 2 myelodysplastic syndrome, 1 myeloproliferative disease, 6 acute lymphoid leukemia, 4 malignant lymphoma, 2 aplastic anemia, 1 multiple myeloma, and 1 other disease. Fifteen and thirteen febrile events were from patients who had myeloablative and non-myeloablative conditioning regimens, respectively.

Results: We documented infection in 16/28 febrile episodes (13 bacterial infections, 2 fungal infections, and 1 viral infection), while 12 febrile episodes were not related to infection (10 acute GVHD, 1 drug, and 1 not specified). To determine whether the presence of infection can be predicted by PCT, we divided the 41 patients into two groups, one with neutrophil counts $< 100/\mu l$ ($N < 100$ group) and the other with $\geq 100/\mu l$ ($N \geq 100$ group). In the $N < 100$ group, the sensitivity, specificity, likelihood ratio, positive predictive value, and negative predictive value were 42.8%, 75%, 1.7, 90.9%, and 27.2%, respectively; in the $N \geq 100$ group, these values were 50%, 75%, 2.0, 33.3%, and 85.7%, respectively. During neutropenia, positive PCT tended to show the presence of infection. However, when the neutrophil count gradually increased, fever with positive PCT tended to have non-infectious factors, such as allograft immunoreactions. These results suggest that the cause of fever could not be predicted by PCT alone when the neutrophils reach a certain level. However, the probability of a false negative prediction of infection by PCT tended to decrease with the increase of neutrophil count. Further analysis will be needed with inflammatory markers and clinical signs together with PCT in a prospective study to determine the utilization of PCT for allo-HSCT patients.

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CARING FOR THE CAREGIVER IN THE STEM CELL TRANSPLANTATION SETTING

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Caring for a sick person, especially one with cancer can be a long term, overwhelming responsibility. Caring for these patients often requires support across the continuum, to address physical, psychosocial, spiritual, and emotional well-being. Expectations include, managing an increasingly complicated healthcare system, remaining optimistic, and taking care of personal needs, usually without support for themselves. This is especially true in stem cell transplantation settings where patient hospitalizations can last for several weeks and daily outpatient clinic visits for several months. Unaddressed caregiver needs present risks to physical and mental health, which in turn may affect the care provided for loved ones.

To address this concern, Caregiver's Week was implemented on a stem cell transplantation unit. This event was designed to address caregiver stress by using techniques such as relaxation, diversion, support, meeting spiritual needs, and providing an opportunity to respond to concerns and questions of caregivers. Program components include Bingo, Tea/TLC, crafts, relaxation, and holiday themed events. Nursing staff is present to address questions, concerns, and listen to caregivers discuss their experiences. A chaplain is available to provide spiritual support as appropriate. This collaborative approach allows caregivers to receive support, as well as support one another.

The response to Caregiver's Week is overwhelmingly positive. Participants report feeling rejuvenated, relaxed, and in better spirits. In addition, they report making friends who are going through the same experience and whom they feel understand their feelings; many of these friendships continue long-term, after patients are discharged.

Supporting caregivers is essential in stem cell transplantation to decrease stress, increase morale, and create support. By providing a week of activities focused on caregivers, staff acknowledges the essential role they play in promoting positive patient care and outcomes. Future plans include continuation of the Caregiver Week activities, incorporating additional supportive measures, as well as creating new innovative events, while continuing to monitor progress and meet caregiver needs.

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SUPPORTING BONE MARROW TRANSPLANT CAREGIVERS: NURSING'S INFLUENCE ON INCORPORATING CAREGIVER SUPPORT SERVICES INTO THE DESIGN OF A NEW BONE MARROW TRANSPLANT UNIT

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During the planning stages of the new North Carolina Cancer Hospital (NCCH), nursing was solicited for their design input. The Bone Marrow Transplant Unit (BMTU) staff nurses at the University of North Carolina Healthcare recognized the opportunity to address some stressors that transplant caregivers may face. Nursing staff used this opportunity to incorporate caregiver support services into the design of the new, larger facility. In an effort to decrease transplant caregiver burden, several amenities for caregivers were created.

In response to caregiver needs, a caregiver suite was created on the unit. Within this area, a laundry room with a full sized washer and dryer was incorporated. Also located within this area are two separate sleep rooms. Each of these rooms contain two beds as well as a television, sofa, and radio for patients' caregivers; allowing them to rest outside of the patient's room without having to leave the hospital. A shower facility is also located within this same area.

A nourishment room was designed for caregivers' convenience. This room contains a full sized refrigerator, microwave, coffee machine, and cabinet space assigned to them for storage. Additionally, the Comprehensive Cancer Support Program within the NCCH offers caregivers breakfast every Friday morning as well as Tuesday night dinner.

The unit's waiting room functions as a meeting space for caregivers. There is a computer, printer, and a microwave for their use. This area hosts a weekly caregiver support group session lead by the BMTU social worker and recreational therapist. A bulletin board is also posted in this area to keep transplant caregivers abreast of support services available to them.

Nursing was highly influential in the implementation of these support amenities that has served to address and decrease some of the daily stressors that some transplant caregivers experience.

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THE EFFECT OF DONOR CYTOMEGALOVIRUS (CMV) SEROLOGIC STATUS ON OUTCOME AND SURVIVAL IN PATIENTS UNDERGOING ALLOGENIC STEM CELL TRANSPLANTATION IN THE ERA OF CMV-PREEMPTIVE THERAPY

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Background: Cytomegalovirus continues to be a common cause of morbidity and mortality after allogenic hematopoietic stem cell transplantation (SCT) despite major advances in diagnostic techniques and antiviral prophylactic strategies. Recipient CMV-seropositivity is a major predictor of adverse outcomes. Data regarding the effect of the donor serologic status on seropositive recipient outcomes remains controversial, with some studies reporting a beneficial effect of seropositive donor, either reduction in relapse or reduction in nonrelapse mortality (NRM), whereas other studies have found no benefit from seropositive donor.

Methods: We reviewed the records of CMV-seropositive patients who underwent allogenic SCT in two tertiary institutions in Singapore between 2006 and 2010. The studied outcomes included CMV reactivation, CMV disease, and 100-day mortality.

Results: 179 CMV-seropositive patients (median age 43) who underwent myeloablative (N = 78) and nonmyeloablative (N = 101), related (N = 122) and unrelated (N = 57) donor allogenic SCT were identified. Among them, 145 (81%) had a CMV-seropositive donor, and 34 (19%) had a CMV-seronegative donor. Median follow-up time was 8.2 months. There were no significant differences in the studied outcomes. CMV reactivation occurred in 93 (64%) patients in the CMV-seropositive donor group, and 23 (68 %) patients in the CMV-negative donor group. CMV disease occurred in 4 (3%) patients in the CMV-seropositive donor group and 2 (6%) in the CMV-seronegative donor group. The 100-day mortality was 11% in both the CMV-seronegative and CMV-seropositive donor group. There was no statistically significant difference in 3 year disease free survival between the two groups. A secondary aim of establishing risk factors for CMV reactivation was performed. In multivariate analysis, the use of thymoglobuline prophylaxis was observed to be the only significant predictors for CMV reactivation. Patients receiving thymoglobuline prophylaxis were observed to be 3.6 times more likely to experience CMV reactivation, as compared to those who did not receive it.

Conclusions: Our study shows that donor CMV serologic status did not significantly affect the incidence of CMV reactivation, CMV disease, 100- day mortality, and disease free survival in CMV-seropositive patients undergoing allogenic SCT. The use of thymoglobuline prophylaxis, however, remains the most important risk factors for CMV reactivation.

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INVASIVE FUNGAL INFECTIONS IN PEDIATRIC HEMATOPOIETIC STEM CELL TRANSPLANT PATIENTS, A RETROSPECTIVE ANALYSIS

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Background: Invasive fungal infections (IFI) remain a major cause of morbidity and mortality in patients (pts) undergoing HCT. The epidemiology of IFI has changed, with a higher proportion of mould infections reported compared to earlier reports (Marr et al. Clin Infect Dis. 2002). The incidence of IFI in children undergoing HCT has been reported at a range of 1.6-25%. The changes in epidemiology of IFI are attributed to multiple factors, including corticosteroid treatment, graft-versus-host disease (GVHD), increase in transplants from alternative donors, and emergence of resistance with use of azoles for IFI prevention. We report a low incidence of IFI in pediatric patients treated in an arid region, using low-dose amphotericin prophylaxis.

Methods: Medical records of 49 of 501 pediatric pts who had undergone 550 HCT procedures at our center between January 1997 and August 2010 have been reviewed. Categorical tables were analyzed using Pearson's chi-square test and the Cochran-Mantel-Haenszel test. Tabular and graphical descriptive survival analyses were performed using cumulative incidence methods accounting for competing risks.

Results: Probable or proven IFI were diagnosed in 49 pts; 44 were diagnosed within 2 years of HCT and were considered to be related to treatment. The median age was 12.8 years (range 1-19.6 years). Amphotericin based prophylaxis was used in 39 pts (87%) and other agents in 5 pts (13%). Yeast and mould infections were diagnosed in 17 (2.7%) and 29 (5.2%) patients respectively. Two patients had both yeast and mould infections. Yeast infection was bi-phasic, the first peak (n = 11) occurring at a median of 56 days (2-360) and the second (n = 6) at 400 days (365-478), post HCT, respectively. The median day for mould infection was day +142 (10-726). HCT modality, GVHD, steroid use, co-infection with viral or bacterial infection and previous HCT were associated with IFI. The immediate outcome of the event was resolution (n = 16, 37%), death from fungal infection (n = 12, 28%) death of disease progression (n = 8, 19%), GVHD (n = 4, 8%) and death from other transplant related complications (n = 4, 8%),

Conclusion: The risk of IFI reported here appears to be lower than historical data. This may be related to the vast use of low-dose amphotericin formulations for prophylaxis, the arid climate, or a combination of both. A prospective study is needed to further elucidate the role of low-dose amphotericin in prevention of IFI in HCT pts.

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INCIDENCE OF HYPERGLYCEMIA IN ACUTE ALLOGENEIC HEMATOPOIETIC STEM CELL TRANSPLANT

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Introduction: Medical literature has established adverse clinical outcomes with hyperglycemia and adverse events in the inpatient setting. There is a paucity of literature documenting the incidence and subsequent effects of hyperglycemia in HSCT patients. The data in other populations shows decreased rates of infection, morbidity and mortality with improved glycemic control. This suggests that improved glycemic control in the HSCT setting could reduce rates of infection, GvHD, and TRM. The goal of this study is to describe the incidence of hyperglycemia in the allo HSCT population.

Patients and Methods: A chart review was conducted on a total of 167 HCST patients up to day +100. Thirty normoglycemic, auto HSCT recipients served as controls. The remaining 137 were allo HSCT recipients. The primary endpoint was the incidence of hyperglycemia defined as one random blood glucose (BG) > 180 mg/dL. Severe hyperglycemia was defined as BG > 250 mg/dL. Secondary endpoints included administration of steroids, insulin, and death. Results were analyzed utilizing Pearson's chi squared test.

Results: Sixty patients had at least one BG from 180-250 mg/dL and 68 had a BG > 250 mg/dL. The overall incidence of hyperglycemia (> 180 mg/dL) was 76% in the study group compared to zero incidence in the control group (p0.007). The majority of patients with hyperglycemia received insulin therapy (95%). Probability of day +100 survival was 72% if BG > 250 mg/dL, 84% for level of 180-250 mg/dL, and 96% with levels < 180 mg/dL. The survival rate in the allo study group for BG < 180 mg/dL was 96% compared to 77% for a BG > 180 (p0.008).

Conclusions: While there is a clear increased incidence of hyperglycemia in the allo HSCT population, it remains unclear if this is causally related to adverse outcomes. Many factors impact survival probability and the relationship of aggressive glucose control and improved outcomes have yet to be examined. Further study of hyperglycemia, confounding variables, and aggressive insulin therapy in a randomized, prospective manner is needed.

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INHALED AEROSOLIZED RIBAVIRIN TREATMENT IN RAPID ANTIGEN TEST NEGATIVE AND MULTIPLEX PCR POSITIVE RESPIRATORY SYNCYTIAL VIRAL PNEUMONIA AFTER STEM CELL TRANSPLANTATION: A SINGLE CENTER EXPERIENCE OVER TWO WINTER SEASONS

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Respiratory Syncytial Virus (RSV) pneumonia leading to respiratory failure can be a significant cause of acute morbidity and mortality in the immuno-compromised host, with mortality rates of 70 to 100 percent being described in bone marrow transplant recipients. High level of suspicion, availability of multiplex polymerase chain reaction (PCR) technique for early detection, and immediate intervention by inhaled Ribavirin may lead to improved outcome.

As a policy of our program, nasal wash samples from the transplant recipients with respiratory symptoms are routinely sent for both rapid antigen detection tests as well as for multiplex respiratory viral panel PCR. We identified a total of 6 patients with RSV pneumonia