standard-calibrated NAT in solid-organ (SOT) and hematopoietic stem cell transplant (HSCT) recipients.

Methods. Sixty-four patients (36 SOT and 28 HSCT) had plasma CMV viral load assessed using the COBAS AmpliPrep/COBAS TaqMan CMV Test (CAP/CTM; lower limit of quantification [LLoQ] at 137 IU/mL) and cobas 6800 System (cobas CMV; LLoQ at 35 IU/mL). Viral load values were correlated with clinical course and outcomes.

Results. Forty-three of 64 patients (67.2%) had CMV infection or disease (asymptomatic, 67.4%; gastrointestinal disease, 16.3%; pneumonitis 4.7%) at median of 4.4 months (IQR 1.4 to 7.7) from transplantation. At CMV infection diagnosis, viral load results (mean ± SD) were almost two-fold higher when measured by cobas CMV (19,456 ± 51,618 IU/mL) compared with CAP/CTM (10,504 ± 27,744 IU/mL; $P = 0.04$). Time to onset of CMV viremia was significantly shorter (11.5 days; $P < 0.001$) while viral clearance was significantly longer (12.75 days; $P < 0.001$) by cobas CMV when compared with CAP/CTM. Persistent viremia was observed with cobas CMV in 44% of patients at the time of first negative results by CAP/CTM. Patients with negative results by cobas CMV at the end of antiviral treatment had a significantly lower need for re-treatment (OR 0.26, 95% CI 0.04 to 0.99, $P = 0.05$).

Conclusion. Our study highlights significant differences between CMV QNAT assays despite calibration to the WHO-international standard. The significant differences in the degree (almost two-fold), time to onset (12 days difference) and clearance (13 days difference) of CMV viremia between two automated commercial QNAT assays have direct implications in the care of transplant recipients. Persistence of low-level viremia was observed in samples that reached negative threshold by CAP/CTM, when tested using the more sensitive cobas CMV. Clearance of CMV viremia, when assessed by the more sensitive cobas CMV, was significantly associated with a lower need for re-treatment.

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1753. Adherence and Immunogenicity of Early Vaccination in Pediatric Allogeneic Hematopoietic Cell Transplantation (allo-HCT) Recipients

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Background. Allo-HCT recipients are at increased risk for vaccine-preventable infections. Early vaccination (EV) beginning at 3–6 months (mo) post-HCT has been shown to be safe, immunogenic, and is recommended. We assessed adherence and immunogenicity to EV in children post-allo-HCT.

Methods. Retrospective analysis of allo-HCT performed 1/1/10–6/30/18 at NCH. Children who died, relapsed, or received anti-CD20 biologics in the 6 mo preceding intended vaccination were excluded. Institutional guidelines recommend EV starting at 6 (+1) mo post-HCT with: 3 PCV13 + 1 PPSV23, IPV, HBV, DTaP and HIB. Vaccination rates were analyzed at 6(+1), 8(+1) and 10(+1) mo post-HCT and serologies were obtained pre- and ≥ 4 weeks post vaccination. Immunogenicity was defined as antibody (Ab) concentrations ≥ 1.3 µg/mL or a 4 fold rise ≥ 70% of 10 PCV13 serotypes, tetanus (T) and diphtheria (D) Ab ≥ 0.1 IU/mL, and HBs Ab ≥ 10 IU/mL. Non-parametric statistics were applied; correlations between T&B cell subsets and IgG pre-vaccination and specific Ab post-vaccination were performed.

Results. During the 8-year study period, 171 allo-HCT were performed: 131 children were eligible for EV (Table 1); however, EV occurred in only 49.6% (65/131) and was completed in 37.5% (45/120) of children at 10(+1) mo post-HCT. Vaccine immunogenicity of PCV13, HBV, T and D was achieved in 40/45, 34/36, 63/64, and 18/18 of evaluable children, respectively. Protective Ab response after EV for PCV13, HBV, T and D was found in 21/24 (87.5%), 14/16 (87.5%), 35/36 (97.2%), and 8/8 (100%) children, respectively. Specific IgG geometric mean concentration pre- and post-vaccination was similar in children whether they received early or delayed vaccination (median 9.8 mo post-HCT, IQR 8–14) (Figures 1 and 2). No correlations were found between absolute CD4, CD8, CD19 and IgG pre-vaccination and vaccines specific Abs post-vaccination (Figure 3).

Conclusion. Despite recommendations, adherence to EV was low among our cohort of allo-HCT recipients and identified opportunities for improvement. Overall, vaccines were immunogenic with no significant differences in Ab concentrations among patients receiving early vs. delayed vaccination. No robust correlations were found between number of T&B cells or total IgG and Ab titers.

Table 1: Demographic and clinical characteristics of pediatric allogeneic-HCT recipients eligible for vaccination at 6 (+1) months post-transplant, January 2010 through June 2018

	Total N=131	Early vaccination N=65	Delayed vaccination N=66	P value Early vs. Delayed
Days post-HCT, median (IQR)	196 (181-248)	185 (177-195)	294 (242-418)	**<0.01**
Age (years), median (IQR)	8.8 (3.6-14.2)	11.9 (6.6-15.3)	7.2 (2.3-12.7)	**0.04**
Males, N (%)	85 (65)	45 (69)	40 (61)	0.36
Underlying, N (%)				
Malignancy	75 (57)	37 (57)	38 (57)	>0.99
Aplastic anemia	13 (10)	7 (11)	6 (9)	0.77
Primary immune deficiency	10 (8)	1 (1)	9 (14)	**0.02**
Hemoglobinophathy	22 (17)	15 (23)	7 (11)	0.06
Other	11 (8)	5 (8)	6 (9)	>0.99
Type of transplant, N (%)				
Matched, related donor	44/129 (34)	24/65 (37)	20/64 (31)	0.57
Matched, unrelated donor	85/129 (66)	41/65 (63)	44/64 (69)	0.57
Source of cells, N (%)				
Peripheral blood mononuclear cells	15 (11)	5 (8)	10 (15)	0.27
Bone marrow	98 (75)	52 (80)	46 (70)	0.22
Cord blood	18 (14)	8 (12)	10 (15)	0.80
Myeloablative, N (%)	67/125 (54)	31/59 (53)	36/65 (55)	0.85
GVHD prophylaxis, N (%)				
Tacrolimus/methotrexate	65/126 (52)	35/61 (57)	30/65 (46)	0.21
Tacrolimus/mycophenolate mofetil	20/126 (16)	8/61 (13)	12/65 (19)	0.47
Other	41/126 (32)	18/61 (30)	23/65 (35)	0.56
GVHD by 6 mo post-HCT, N (%)	22 (17)	8 (12)	14 (21)	0.24
Systemic steroids at 6 mo post-HCT, N (%)	9 (7)	0 (0)	9 (13)	**<0.01**
IVIG at 6 mo post-HCT, N (%)	32 (24)	10 (15)	22 (32)	**0.02**

Figure 1: Comparison of ten PCV13 serotypes IgG geometric mean concentrations (GMC) in allo-HCT recipients vaccinated early and delayed

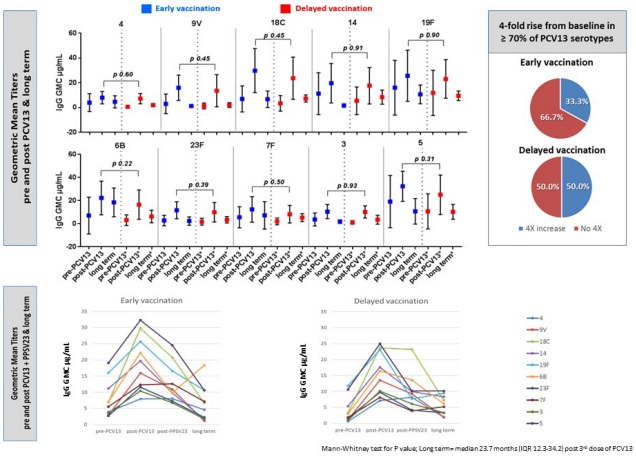


Figure 2: Comparison of HBV, tetanus and diphtheria IgG geometric mean concentrations (GMC) in allo-HCT recipients vaccinated early and delayed

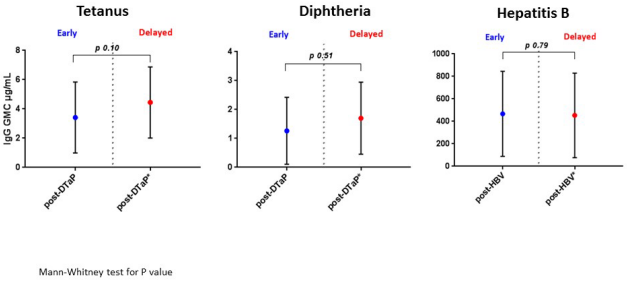
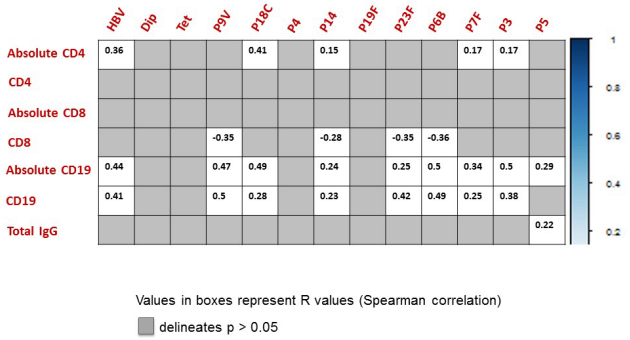


Figure 3: Correlations between T&B cells subsets & total IgG pre-vaccination & antibodies titers post vaccination



Disclosures. **All authors:** No reported disclosures.

1754. Pre-Transplant Vaccination Rates in Solid-Organ Transplant Recipients

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Background. Recipients of solid-organ transplants (SOT) are at increased risk of vaccine-preventable illnesses. Because of the immunosuppression administered following SOT, live vaccines are generally contraindicated post-SOT, and response to inactivated vaccines may be suboptimal. National and international guidelines recommend optimizing immunizations prior to SOT. We analyzed rates of vaccination for SOT candidates in a cohort of adult kidney and liver transplant recipients.

Methods. A retrospective chart review of adult kidney, kidney/pancreas (KP) and liver transplant recipients was conducted between 2014 and 2016. We calculated the rates of vaccinations of the following vaccines: pneumococcus, meningococcus, Hepatitis A and B, *Haemophilus influenzae* type B, measles, mumps, rubella, polio, tetanus, diphtheria and pertussis.

Results. 300 patients were included (147 kidney, 14 KP, 139 liver). Liver recipients were older (mean age 53 vs. 50; $P = 0.028$) and less likely to have had a previous transplant (5.8% vs. 21.1%; $P < 0.001$) or a living donor (15.8% vs. 32.3%, $P = 0.01$).

Liver recipients were more likely to have been vaccinated against hepatitis A (106 [53.9%] vs. 28 [17.4%]; $P < 0.001$). Kidney and KP recipients were more likely to have received at least 1 dose of hepatitis B vaccine (138 [85.7%] vs. 91 [65.5%]; $P < 0.001$) or at least 1 dose of any of the pneumococcal vaccines (PSV23 94 [67.6%] vs. 92 [57.1%]; $P = 0.062$; PCV13 130 [80.7%] vs. 93 [66.9%]; $P = 0.006$; pneumococcal vaccine not clarified 47 [29.2%] vs. 14 [10.1%]; $P < 0.001$). No difference was observed with regards to other vaccines (Table 1). Being a kidney transplant recipient increased the odds of getting at least 1 dose of hepatitis B, tetanus/diphtheria/acellular pertussis (Tdap), measles, and pneumococcal vaccine (OR = 1.75, 95% CI [1.063–2.864]; $P = 0.028$)

Conclusion. In our cohort, kidney transplant recipients were more likely to have received pre-transplant vaccination. Despite the availability of local and international guidelines, vaccination in SOT candidates remains suboptimal and further study of barriers to implementation of these guidelines is warranted to inform future quality improvement initiatives.

Table 1 : Vaccination doses

Vaccine	Doses	Kidney & Kidney-Pancreas (N = 161)	Liver (N = 139)	p value
***Haemophilus influenzae* type B**	0	85 (52.8%)	59 (42.4%)	0.339
	1	69 (42.9%)	74 (53.2%)	
	≥ 2	7 (4.3%)	6 (4.3%)	
Hepatitis A	0	133 (82.6%)	64 (46.0%)	**<0.001**
	1	14 (8.7%)	17 (12.2%)	
	≥ 2	14 (8.7%)	58 (41.7%)	
Hepatitis B	0	23 (14.3%)	48 (34.5 %)	**<0.001**
	1	31 (19.3%)	5 (3.6%)	
	2	22 (13.7%)	14 (10.1%)	
	3	42 (26.1%)	33 (23.7%)	
	4	18 (11.2%)	15 (10.8%)	
	5	10 (6.2%)	9 (6.5%)	
	≥6	15 (9.3%)	15 (10.8%)	
Polio	0	61 (37.9%)	47 (33.8%)	**0.014**
	1	22 (13.7%)	6 (4.3%)	
	2	33 (20.5%)	26 (18.7%)	
	≥3	45 (27.9%)	35 (43.2%)	
Measles	0	94 (58.4%)	89 (64.0%)	0.710
	1	42 (26.1%)	28 (20.1%)	
	≥ 2	25 (15.5%)	22 (15.8%)	
Mumps	0	94 (58.4%)	92 (66.2%)	0.165
	≥ 1	67 (41.6)	47 (33.8%)	
Rubella	0	94 (58.4%)	91 (65.5%)	0.208
	≥ 1	69 (41.6%)	48 (34.5%)	
Pneumococcus (PSV23)	0	69 (42.9%)	45 (32.4%)	0.062
	≥ 1	92 (57.1%)	94 (67.6%)	
Pneumococcus (PCV13)	0	31 (19.3%)	46 (33.1%)	**0.006**
	≥ 1	130 (80.7%)	93 (66.9%)	
Pneumococcus (Unspecified)	0	114 (70.8%)	125 (89.9%)	**<0.001**
	≥ 1	47 (29.2%)	14 (10.1%)	
Tetanus	0	16 (9.9%)	20 (14.4%)	0.237
	≥ 1	145 (90.1%)	119 (85.6%)	
Diphtheria	0	16 (9.9%)	20 (14.4%)	0.237
	≥ 1	145 (90.1%)	119 (85.6%)	
Acellular Pertussis	0	28 (17.4%)	27 (19.4%)	0.650
	≥ 1	133 (82.6%)	112 (80.6%)	
Meningococcus	0	54 (33.5%)	80 (57.6%)	**<0.001**
	≥ 1	107 (66.5%)	59 (42.4%)	

PSV23 = 23-valent pneumococcal polysaccharide vaccine, PCV13 = 13-valent pneumococcal conjugate vaccine

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1755. Assessment of Vaccine Rates in Solid-Organ Transplant Recipients and Identification of factors Associated with Completion of Vaccination

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Background. Vaccine administration is an essential component of pre and post-transplant care. Although Society guidelines for vaccination of solid-organ transplant recipients (SOT) are published, rates of vaccination remain low and potential factors influencing these rates are not well identified.

Methods. A retrospective review of electronic medical records (EMR) was done for all adult SOT patients who underwent transplantation from January 2015 to December 2016 at Henry Ford Hospital, Detroit, MI. Sociodemographic data, comorbidities, and vaccination status at 1-year post-SOT for influenza, pneumococcus, hepatitis A and B, Tdap, and Td vaccines were assessed from EMR and the Michigan Care Improvement Registry. Data were analyzed using SAS 9.4 software, univariate analysis was done with Chi-square test, t-test, and multivariate analysis with logistic regression.

Results. 530 patients underwent SOT during the study period. Characteristics of the study population are shown (Table 1). The median age was 59, mean Charlson Comorbidity Index was 5.25, 58.3% had smoking history. At 1-year post SOT, 88.7% had received ≥1 vaccine(s), whereas 11.3% received no vaccines. Most patients received vaccines before SOT. Influenza (69.4%) and pneumococcal (69.3%) vaccines were the most administered (Table 2). On univariate analysis, pre-SOT visits with a primary care provider (PCP), transplant team or PCP based at our institution were significantly associated with vaccination (Table 3). On multivariate analysis, PCP based at our institution (odds ratio [OR], 2.03 [95% confidence interval {CI}, [1.06–3.88], $P = 0.033$) and pre-SOT PCP visits (OR 1.47, [95% CI 1.11–1.96], $P = 0.008$) were significantly associated with vaccine uptake. Smoking history negatively impacted vaccine uptake (Table 4). Patients who had received the influenza vaccine(s) were significantly associated with increased uptake of other vaccines ($P < 0.0001$).

Conclusion. Despite guidelines, vaccination rates in SOT patients remain low at our institution. Factors associated with improved vaccination were institution-based PCP, pre-SOT PCP visits and receipt of influenza vaccines. A multidisciplinary approach is required for the optimization of vaccination rates in the SOT population.

Table 1. Characteristics of 530 SOT recipients

Variable	Value
Age (year), median (IQ)	59 (50-67)
Male sex (N, %)	337 (63.6)
Race (N, %)	
Asian	12 (2.26)
Black	157 (29.62)
Other	25 (4.72)
White	336 (63.4)
Transplant type (N, %) *	
Heart	40 (7.55)
Kidney	225 (42.45)
Liver	171 (32.26)
Lung	45 (8.49)
Multivisceral	39 (7.36)
Pancreas	3 (0.57)
Small bowel	7 (1.32)
Months since transplant (median, IQ)	
Overall	35.6 (31-44)
Heart	32.5 (28-43)
Kidney	38 (32-44)
Liver	37 (30-44)
Lung	40 (30-44)
Multivisceral	36 (29-43)
Pancreas	43 (38-51)
Small bowel	33 (11-37)
Insurance type (N, %)	
Blue Care Network	20 (3.77)
Blue Cross Blue Shield	89 (16.79)
HAP	45 (8.49)
Medicaid	50 (9.43)
Medicare	284 (53.58)
Other	42 (7.92)
Distance (miles) to transplant center (mean, IQ)	
Overall	78.20 (14.5-78.7)
Heart	26.66 (8.5-29.3)
Kidney	56.23 (12.6-59.4)
Liver	118.27 (19.5-137.2)
Lung	92.54 (16.8-87.5)
Multivisceral	66.08 (15.9-105.5)
Pancreas	28.30 (13.7-50.5)
Small bowel	96.80 (17.6-207.2)
CCI score (Mean, SD)	
Overall	5.25 (2.48)
Heart	4.35 (2.23)
Kidney	4.78 (2.37)
Liver	6.51 (2.13)
Lung	3.04 (1.49)
Multivisceral	6.72 (1.90)
Pancreas	4.33 (0.58)
Small bowel	1.00 (1.00)
Smoking history (N, %) *	309 (58.3)
Deaths (N, %)	64 (12.08)
HFHS PCP (N, %) *	227 (42.8)
Received any vaccine (N, %)	470 (88.7)

Abbreviations: IQ, interquartile range; SD, standard deviation; CCI, Charlson Comorbidity Index, HFHS PCP, PCP from Henry Ford Health System. * Represents statistically significant difference between SOT recipients who received any vaccine and those who did not.

Table 2. Vaccination status in 530 SOT recipients

Vaccine	Eligible pre-transplant, N	Vaccinated pre-transplant, N (%)	Vaccinated post-transplant, N (%)	Total patients vaccinated, N (%)	P value
Influenza	530	247 (46.6)	121 (22.8)	368 (69.4)	<0.0001
Pneumococcal	530	270 (50.9)	97 (18.3)	367 (69.3)	<0.0001
Hepatitis A*	447	60 (13.4)	51 (11.4)	111 (24.8)	<0.0001
Hepatitis B**	382	167 (43.7)	11 (2.88)	178 (46.6)	<0.0001
Tdap	530	167 (31.5)	58 (10.9)	225 (42.5)	<0.0001
Td	530	6 (1.1)	76 (14.3)	82 (15.5)	<0.0001

Note: * 83/530 (15.66%) SOT recipients were already immune to Hep A. **148/530 (27.92%) SOT recipients were already immune to Hep B before transplant.