

SARS-CoV-2 Vaccine-Induced Immunogenicity among Hematopoietic Stem Cell Transplant Recipients

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Introduction

- SARS-CoV-2 vaccination reduces the risk and severity of coronavirus disease 2019 (COVID-19), but immunogenicity may be reduced in patients undergoing hematopoietic stem cell transplantation (HSCT).
- The variables that impact the humoral response such as; age, gender, pre-transplant diagnosis, transplant type, prior treatments, and vaccine type, have not been comprehensively described.

Methods

- Study design:** A retrospective chart review was conducted at a single-center using records of HSCT recipients who received COVID-19 vaccinations between 2020 and 2022. Patients were included if ≥ 18 years and had received at least a single dose of Pfizer, Moderna or Johnson & Johnson (J&J) vaccine
- Assay/sample collection:** Anti-Spike (S) IgG titers were quantitatively measured at provider discretion during routine care using the Roche Elecsys Anti-SARS-CoV-2 spike immunoassay. Patients were categorized as Responders (≥ 0.8 U/mL) and Non-responder (< 0.8).
- Demographic and treatment data:** This Included baseline characteristics, pre-transplant conditioning regimen, type of transplant, pre- and post-transplant treatment for graft vs host disease.
- Analysis:** A Multivariate linear regression analysis was used to estimate the correlation coefficient and 95% confidence intervals (CIs) using the quantitative anti-S IgG titer. A logistic regression was also used after categorizing patients as Responders vs Non-responders. Controlled risk factors included; patients demographics, transplant and treatment characteristics as well as history of graft-versus host disease (GVHD).

Results

Table 1. Baseline characteristics

	Total
	N=152
Age (yrs)	57.3 (14.3)
Sex	
male	54% (82)
Race	
White	91% (139)
Mean anti-S IgG titre (U/ml)	1188.5 (1143.0)
Mean time to anti-S IgG (days)	120.1 (112.0)
WBC count pre-first dose	6.4 (14.7)
Lymphocyte count pre-first dose	2.5 (5.9)
IgG level (mg/dL) pre-first dose	755 (368)
CD4 count (mean)	369.8 (338.4)
Transplant type	
Allogeneic	81.6% (124)
Autologous	18.4%(28)
Acute GVHD	
Yes	15% (22)
Chronic GVHD	
yes	38% (57)

Data are presented as mean (SD) for continuous measures, and % (n) for categorical measures.

Table 2a. Univariate logistic regression analysis (Responders vs Non-responders)

Anti-S IgG Response status	Odds ratio	P>z	[95% conf. interval]
Sex			
Male	0.10	0.03	0.01 0.84

Table 2b. Multivariate linear regression analysis of quantitative anti-S IgG titre

Anti-S IgG	Coefficient	P>t	[95% conf. interval]
Age	-27.11	0.02	-49.87 -4.36
Sex	-339.12	0.36	-1088.84 410.59
WBC	-82.71	0.19	-208.26 42.83
Lymphocyte	-13.67	0.71	-86.50 59.15
CD4 count	0.51	0.35	-0.58 1.61
Transplant type	-1313.77	0.25	-3589.55 962.02
Acute GVHD	-569.04	0.30	-1677.18 539.10
Chronic GVHD	-95.11	0.79	-814.46 624.23

Fig 1. Two-way Scatter Plot; Anti S IgG:

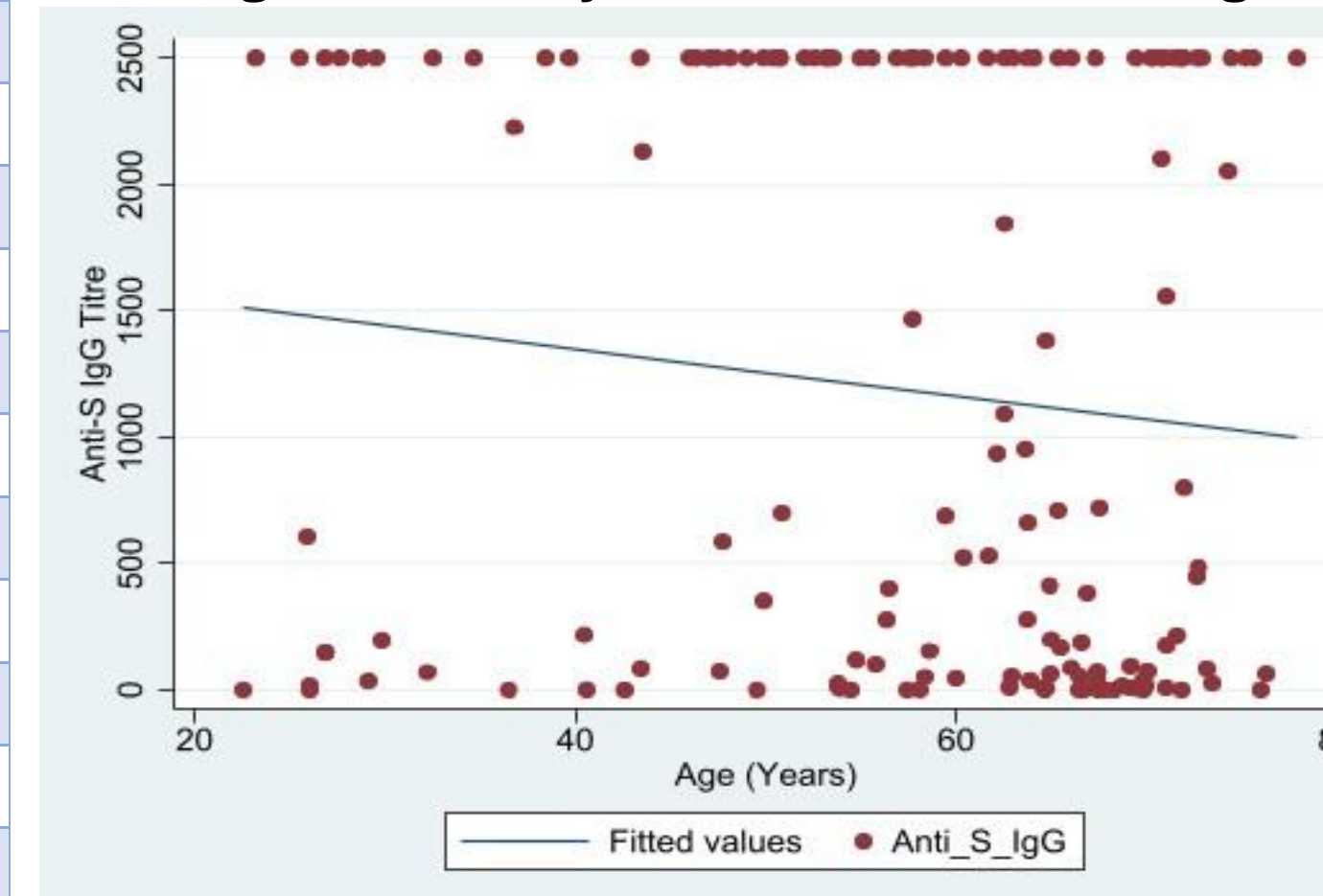


Fig. 2 Vaccine series

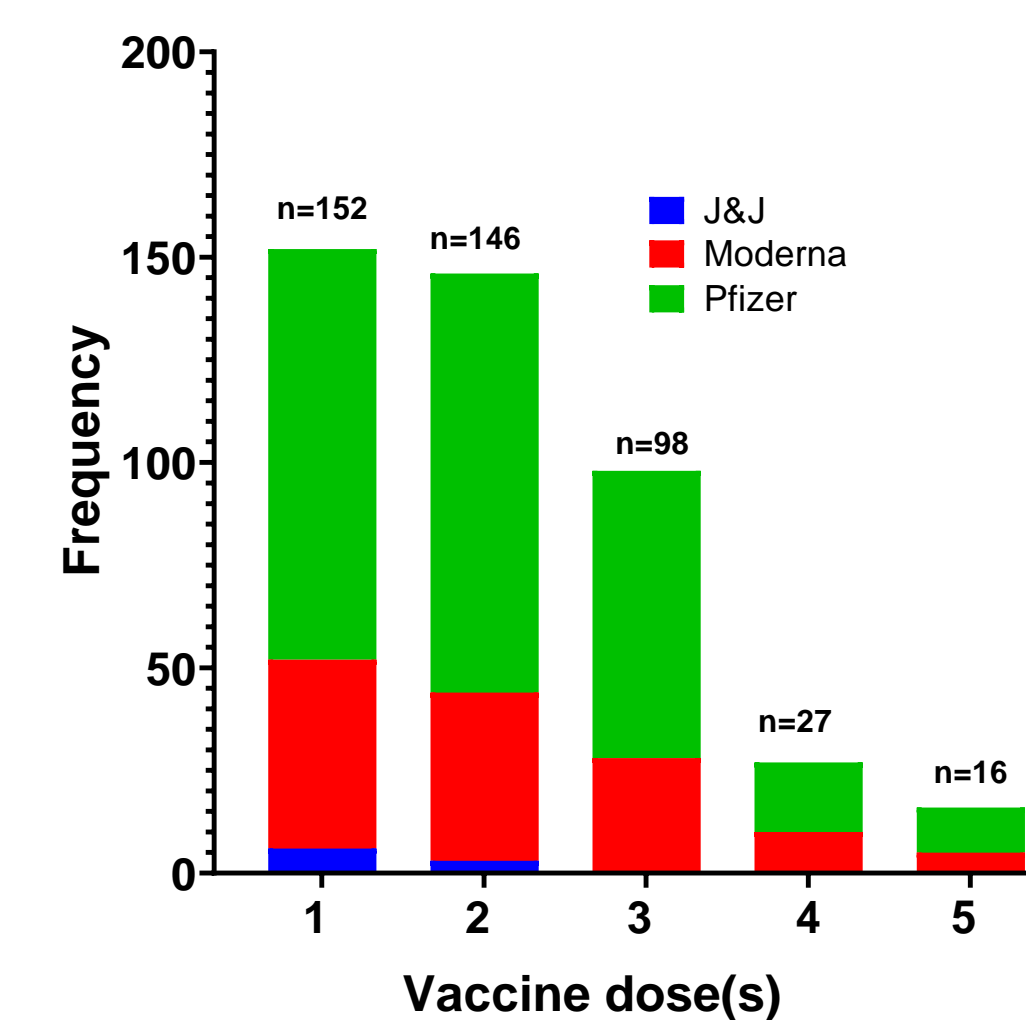


Fig. 3 Anti-S IgG titres and GVHD

Median titre: 710.2 vs 661.3

p=0.88

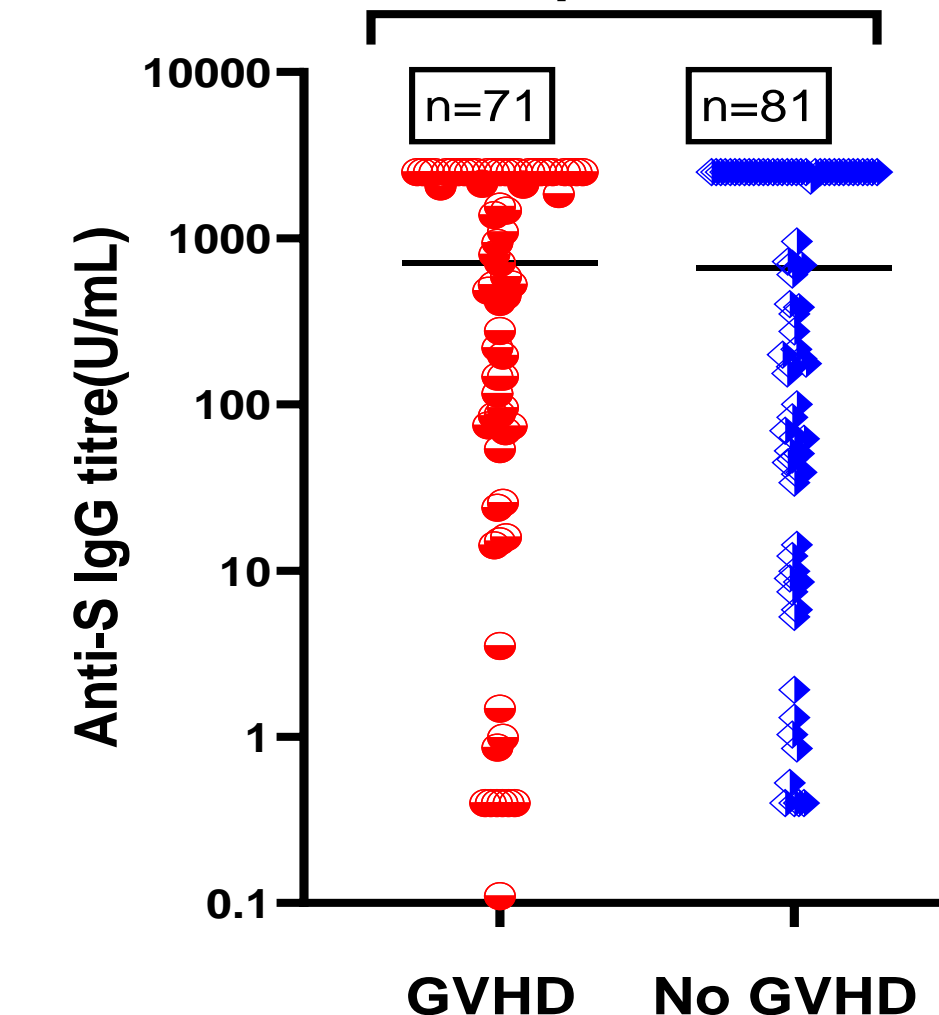


Fig. 4 Anti-S IgG response since days post vaccination

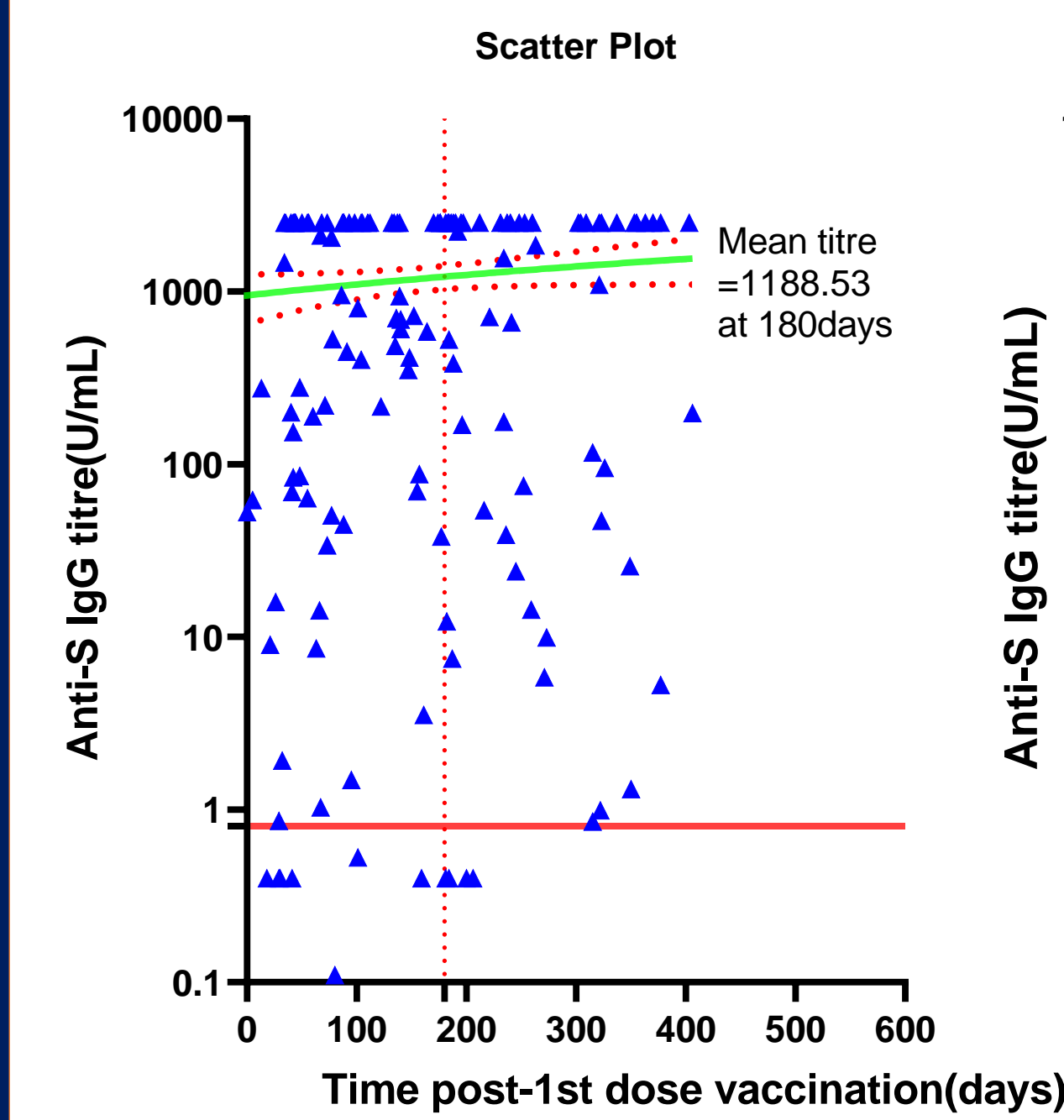
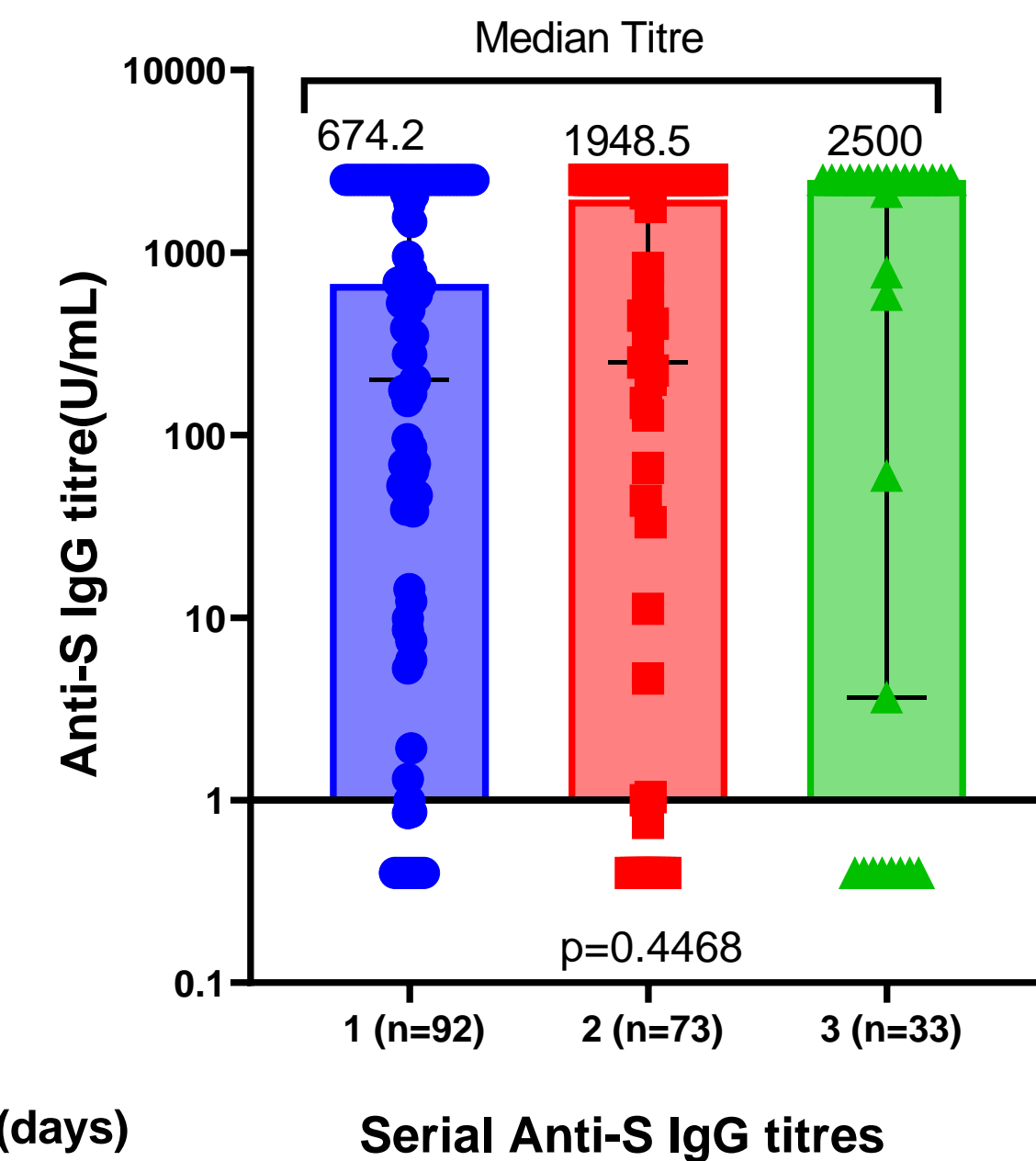


Fig 5. Anti-S IgG response with 3 serial doses of COVID vaccines



Summary and Conclusions

- 141 (92.7%) were responders with a median titre of 674.25U/mL IQR(100.5 - 2500) at a median time of 139 days IQR (56 - 231) from 1st dose vaccination
- Being Male was associated with a significantly higher odds of being a responder
- Increasing age was significantly associated with a lower quantitative anti-S IgG titres
- Other demographic characteristics; presence or absence of GVHD, type of transplant were not associated with anti-S IgG protein positivity and titre among HSCT recipients
- Anti-S antibody titre increased with increasing dose of the vaccines but was sub-optimal .
- More studies are needed to characterize the precise anti-S IgG titre and biomarker(s) that predicts sero-protectiveness against COVID-19.

Disclaimer: The views expressed are those of the authors and should not be construed to represent the positions of the U.S. Army, the Department of Defense, or the Henry M. Jackson Foundation for the Advancement of Military Medicine.

