MAJOR ARTICLE

Association Between Transfusion With Human Herpesvirus 8 Antibody–Positive Blood and Subsequent Mortality

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(See the editorial commentary by Operskalski, on pages 1485–7.)

Background. Human herpesvirus 8 (HHV-8) is endemic in Uganda and transmissible by blood. We evaluated mortality following transfusion of HHV-8 antibody–positive blood.

Methods. In a hospital-based, observational, prospective cohort study with a 6-month follow-up, we examined the effect of HHV-8 antibody–positive blood on transfusion recipients surviving at least 7 days.

Results. Of 1092 recipients, 471 (43.1%) were transfused with HHV-8 antibody–positive blood. Median age was 1.8 years (range, 0.1–78); 111 (10.2%) died during follow-up. After adjusting for confounders (increasing age, human immunodeficiency virus infection, illness other than malaria, receipt of multiple transfusions), recipients of HHV-8 antibody–positive blood stored ≤4 days ("short-stored") were more likely to die than recipients of HHV-8 antibody–negative blood (adjusted hazards ratio [AHR], 1.92; 95% confidence interval [CI], 1.21–3.05; $P = .01$). The AHR of the effect of each additional short-stored HHV-8 antibody–positive transfusion was 1.79 (95% CI, 1.33–2.41; $P = .001$).

Conclusions. Transfusion with short-stored HHV-8 antibody–positive blood was associated with an increased risk of death. Further research is warranted to determine if a causal pathway exists and to verify the observed association between acute HHV-8 infection and premature mortality.

Human herpesvirus 8 (HHV-8 or Kaposi's sarcoma–associated herpes virus) causes Kaposi's sarcoma, multicentric Castleman's disease, and primary effusion lymphoma [1]. In Uganda and other sub–Saharan African countries, Kaposi's sarcoma is frequent [2] and causes substantial morbidity and mortality. However, there is a paucity of literature describing any adverse outcomes following acute HHV-8 infection.

In sub–Saharan Africa, adult HHV-8 seroprevalence can exceed 50%, [1] with similarly high seroprevalence in healthy blood donors. The possibility of HHV-8 infection through blood transfusion has been suggested [3–5] and was demonstrated in a study in Uganda [6]. We analyzed data from the same prospective, observational cohort study to compare the risk of death within 6 months following transfusion of blood that was positive for HHV-8 antibodies with that following transfusion of blood that was negative for HHV-8 antibodies.

METHODS

Transfusion Recipients and Blood Donations

As previously described [6], between December 2000 and July 2001, written informed consent (and assent, as appropriate) was obtained from transfusion recipients or their parents or guardians if participants were

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aged <18 years at Mulago Hospital, Kampala, Uganda. Transfusion recipients were eligible for enrollment if their pretransfusion specimen after blood typing and cross-matching was available, identifying information for the transfused blood was known, and no other transfusions had taken place in the previous 6 months. Follow-up visits were scheduled at 1, 2, and 4 weeks post-transfusion, then monthly for 5 additional months. Participants were also seen at the study clinic for unscheduled acute care visits free of charge. At enrollment and each follow-up visit, blood was drawn, and a questionnaire was administered to collect information on patient demographics, health, and repeat transfusions. Participants who did not return for scheduled visits were followed up at home, and any deaths were recorded (Figure 1).

From November 2000 to September 2001, all blood donors in central Uganda were offered study participation, and blood specimens from consenting donors were stored for HHV-8 serologic testing. Donations were screened at the Uganda Blood Transfusion Services for human immunodeficiency virus (HIV), hepatitis B surface antigen, and *Treponema pallidum* and stored at 4°–8° C according to routine procedures. Most blood was divided into plasma and several smaller packed red blood cell units for use in young children; some blood units were left undivided for use in adults, although such units were sometimes split at the hospital into smaller units for use in children. Leukoreduction filters were not used; the buffy coat was partially removed from packed cell units.

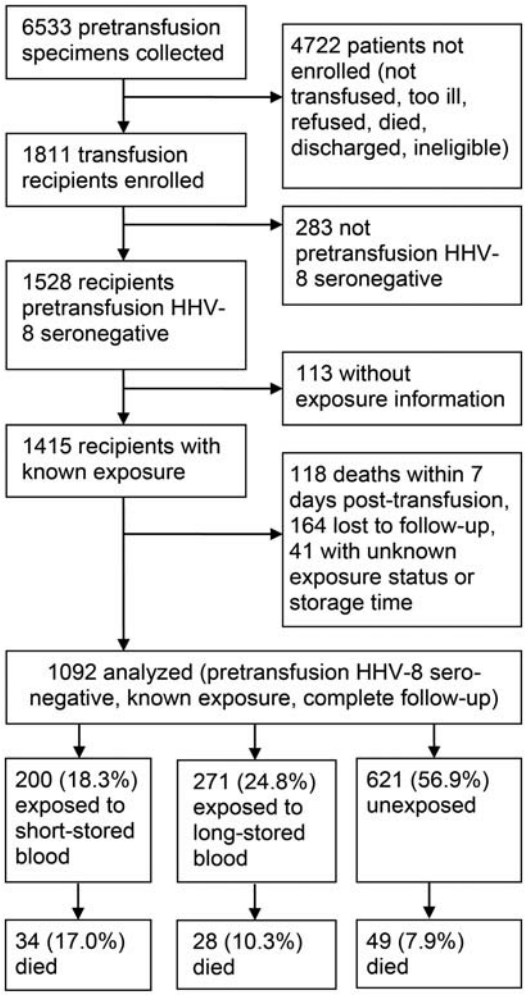

Figure 1. Trial profile of transfusion recipients.

Laboratory Procedures

Recipient plasma collected pretransfusion was tested for hemoglobin levels and HIV antibodies. HIV reactivity was confirmed by polymerase chain reaction if recipients were aged ≤24 months. Pretransfusion recipient blood and linked blood donor specimens were tested for HHV-8 antibodies at the Centers for Disease Control and Prevention (CDC) laboratory in Atlanta, as previously described [6].

Exposure Classification and Transfusion Events

Each transfusion was treated as a discrete event and was counted separately. Each transfusion could comprise ≥1 blood units (depending on patient body weight and degree of anemia as well as blood unit size and availability). Most recipients who received multiple transfusions did so within the first 7 days of their hospital stay. For the purpose of this analysis, an "exposed" person received ≥1 transfusions with HHV-8 antibody–positive blood products whether or not exposure to or infection with the virus occurred. Laboratory testing for antibodies against HHV-8 took place only after completion of follow-up. Recipients transfused with any HHV-8 antibody–positive blood units in the first 7 days were classified as "exposed," whereas recipients transfused exclusively with HHV-8 antibody–negative blood were classified as "unexposed." Because previous analysis of data from the same study found that HHV-8 antibody–positive blood stored ≤4 days was likely responsible for most transfusion-associated HHV-8 infections [6], recipients were grouped into risk categories from high to low as follows: (1) exposed to (any) HHV-8 antibody–positive blood stored ≤4 days (short-stored); (2) exposed to HHV-8 antibody–positive blood stored >4 days (long-stored); or (3) unexposed. Transfusions of blood products with any HHV-8 antibody status occurring after 7 days of the first transfusion (usually following readmission to the hospital) were regarded as "repeat" transfusions.

Data Management and Analysis

Data were entered in duplicate using Epi Info 6.04 (CDC) and analyzed using SAS software (SAS Institute). We excluded participants who were positive for HHV-8 antibodies pretransfusion or who were lost to follow-up. Recipients who received blood of unknown or equivocal HHV-8 serostatus and were not

also transfused with short-stored HHV-8 antibody–positive blood were also excluded. Participants were censored for the first 7 days following their initial transfusion and the first 7 days following the first subsequent transfusion that changed their HHV-8 exposure status to exposed. Transfusion recipients who died within 7 days of their initial transfusion or their first HHV-8 antibody–positive transfusion were removed from analysis, assuming that any effect of receipt of HHV-8 antibody–positive blood on mortality would take longer than 1 week to materialize. Using SAS Tphreg, we performed Cox proportional hazards analysis to estimate the hazard of death for potential risk factors (age, HIV serostatus, pretransfusion anemia, reason for transfusion, number of transfusions, and exposure to HHV-8 antibody–positive blood). We then estimated the adjusted hazard ratio (AHR) for receipt of short-stored HHV-8 antibody–positive blood by controlling simultaneously for these confounders. We repeated the main multivariate analysis with the reference group ("unexposed") restricted to recipients of short-stored HHV-8 antibody–negative blood only. No data anomalies or interactions were noted when we examined multiple-variate results in conjunction with individual-variate results.

Using SAS Proc Logistics, we adjusted for the same confounders and estimated the adjusted odds ratio for death among recipients of short-stored HHV-8 antibody–positive blood within the first 60 days of follow-up. We also estimated the adjusted population-attributable fraction of death due to receipt of short-stored HHV-8 antibody–positive blood as a function of follow-up time under the assumptions of the proportional hazard model and that censoring time is independent of event time [7].

The study was approved by the institutional review boards of the Uganda Virus Research Institute, the Uganda National Council for Science and Technology, and the CDC.

Enrollment and Follow-Up

Pretransfusion blood specimens for 6533 potential transfusion recipients were sent to the hospital's blood bank for typing and cross-matching (Figure 1). Of these, 1811 participants were enrolled; the remaining were not transfused (31%), were ineligible (28%), were too ill to consent (5%), refused to consent (13%), died prior to enrollment (2%), or were discharged prior to enrollment (22%). Of the 1811 enrolled recipients, 1528 (84%) were negative for HHV-8 antibodies pretransfusion. Of these, 436 (29%) were excluded from analysis because of unknown exposure status (10%), early death within 7 days of transfusion (8%), or loss to follow-up (11%).

RESULTS

We included 1092 pretransfusion HHV-8 antibody–negative recipients in the analysis (Table 1). These patients were transfused a total of 1328 times (median, 1; range, 1–8) with 2416 blood units (median, 1; range, 1–16) from 1498 blood donations. Most blood units transfused were packed red blood cells (78%), followed by whole blood (14%), blood of unknown product type (8%), and plasma and/or platelet products (<1%). Most recipients were aged <5 years (median age, 1.8 years; range, 0.1–78 years) and had malaria as a baseline diagnosis. Recipients transfused for malaria were younger than recipients transfused for other reasons (median age, 1.3 vs 17.0 years).

Median follow-up was 167 days (interquartile range [IQR], 116–169 days) and was similar among exposed and unexposed recipients. Among blood donations linked to study participants, HHV-8 antibody positivity was 36.5%. Among study participants, 471 (43.1%) were exposed, and 621 (56.9%) were unexposed. Among the exposed recipients, most (69%) were transfused with a single HHV-8 antibody–positive unit; the remainder received 2 (17%) or >2 (14%) units. Among those exposed to short-stored HHV-8 antibody–positive blood, 67% received 1 such blood product, 19% received 2, and 14% received ≥3. Recipients across the different exposure groups had similar HIV prevalence, pretransfusion anemia status, and reason for transfusion, but they differed by sex, age, and number of transfusions or blood units received (Table 1).

One hundred eleven (10.2%) recipients died during follow-up, with a median time from transfusion to death of 43 days (IQR, 19–73 days). Of the 621 unexposed recipients, 49 (7.9%) died, and of the 271 recipients of long-stored HHV-8 antibody–positive blood, 28 (10.3%) died, compared with 34 (17.0%) of the 200 recipients of short-stored HHV-8 antibody–positive blood. Using person-time as the denominator, unadjusted mortality per 100 person-years was 20.1 for recipients transfused with HHV-8 antibody–negative blood, 26.0 for recipients transfused with long-stored HHV-8 antibody–positive blood, and 44.2 for recipients transfused with short-stored HHV-8 antibody–positive blood.

In bivariate analysis, significant risk factors for death included age, HIV infection, illness other than malaria, receipt of multiple transfusions, and receipt of short-stored HHV-8 antibody–positive blood (Table 2). In multivariate analysis, transfusion with short-stored HHV-8 antibody–positive blood remained significantly associated with mortality during follow-up (AHR, 1.92; $P = .01$) (Table 2). When we restricted the multivariate analysis to the first 60 days of follow-up, the risk of death remained significant (adjusted odds ratio 2.29; 95% confidence interval [CI], 1.29–4.09, $P = .005$). Receipt of long-stored HHV-8 antibody–positive blood was not significantly associated with an excess risk of death ($P = .58$). When the reference group for the multivariate analysis was restricted to recipients of short-stored HHV-8 antibody–negative blood, the AHR due to receipt of short-stored HHV-8 antibody–positive blood remained statistically significant (AHR, 2.39; $P = .005$) and no significant risk of death was associated with

Table 1. Characteristics of Study Participants by Human Herpesvirus 8 (HHV-8) Antibody Exposure Status

Characteristic	Exposure Status (transfusion with HHV-8 antibody–positive blood, by storage time)				*P* Value
	All (N = 1092)	Stored >4 days (n = 271)	Stored ≤4 days (n = 200)	Unexposed (n = 621)	
Age, years					
Median (range)	1.80 (0.1–78)	1.50 (0.2–59)	1.85 (0.1–78)	1.50 (0.1–78)	.03[a]
Sex, female	575 (52.7)	140 (51.7)	123 (61.5)	312 (50.2)	.02
HIV status					
Negative	948 (86.8)	233 (86.0)	177 (88.5)	538 (86.6)	.24
Positive	112 (10.3)	25 (9.2)	18 (9.0)	69 (11.1)	
Missing	32 (2.9)	13 (4.8)	5 (2.5)	14 (2.3)	
Pretransfusion anemia status					
Anemic	791 (72.4)	197 (72.7)	140 (70.0)	454 (73.1)	.67
Not anemic	17 (1.6)	6 (2.2)	4 (2.0)	7 (1.1)	
Unknown	284 (26.0)	68 (25.1)	56 (28.0)	160 (25.8)	
No. transfusions received					
1	937 (85.8)	210 (77.5)	147 (73.5)	580 (93.4)	<.0001
≥2	155 (14.2)	61 (22.5)	53 (26.5)	41 (6.6)	
No. blood units received					
1	868 (79.5)	191 (70.5)	134 (67.0)	543 (87.4)	<.0001
2	135 (12.4)	43 (15.9)	38 (19.0)	54 (8.7)	
≥3	89 (8.1)	37 (13.6)	28 (14.0)	24 (3.9)	
Reason for transfusion					
Malaria	912 (83.5)	220 (81.2)	163 (81.5)	529 (85.2)	.23
Other/unknown	180 (16.5)	51 (18.8)	37 (18.5)	92 (14.8)	
Survival status					
Alive	981 (89.8)	243 (89.7)	166 (83.0)	572 (92.1)	.001
Dead	111 (10.2)	28 (10.3)	34 (17.0)	49 (7.9)	
Time to death, days					
Median	43	50	35	37	<.0001[a]

Data are no. (%) unless otherwise noted.

Abbreviation: HIV, human immunodeficiency virus.

[a] *P* value based on difference in mean values.

transfusion of either long-stored HHV-8 antibody–positive or long-stored HHV-8 antibody–negative positive blood (Table 3).

With the multivariate model restricted to recipients of a single transfusion (n = 937), the hazard for death due to receipt of short-stored HHV-8 antibody–positive blood remained (AHR, 1.95; 95% CI, 1.10–3.45; $P = .02$). With the model restricted to recipients of a single blood unit (n = 868), the hazard for death upon receipt of short-stored HHV-8 antibody–positive blood was similar but not statistically significant (AHR, 1.70; 95% CI, .94–3.09; $P = .08$).

In a separate analysis, we restricted the risk set to recipients of a single blood unit and kept the reference group defined as recipients of a single short-stored HHV-8 antibody–negative blood unit. In this model, recipients of a single short-stored HHV-8 antibody–positive blood unit had a significantly higher mortality than reference group recipients (AHR, 2.19; 95% CI, 1.06–4.53; $P = .03$), whereas there was no excess risk of death among recipients of a single long-stored HHV-8 antibody–negative or HHV-8 antibody–positive blood unit. We also analyzed the data in a separate multivariate model similar to that shown in Table 2 except that exposure to HHV-8 antibody–positive blood was expressed as the continuous number of short- or long-stored HHV-8 antibody–positive or HHV-8 antibody–negative blood units. In this model, additional short-stored HHV-8 antibody–positive blood units transfused provided no survival benefit (AHR, 0.94; 95% CI, .61–1.43); whereas for all other blood units, each additional transfused unit had a protective effect on survival (long-stored HHV-8 antibody–positive: AHR, 0.67; 95% CI, .49–.93; short-stored HHV-8 antibody–negative: AHR, 0.53, 95% CI, .33–.83; compared with transfusion with long-stored HHV-8 antibody–negative units).

We also altered the main model (as shown in Table 2) such that the number of transfusions (by HHV-8 serostatus and storage time) replaced the categorical exposure variables and

Table 2. Risk Factors for Post-Transfusion Mortality, N = 1092 (human herpesvirus 8 [HHV-8] reference group: transfused with short- or long-stored HHV-8 antibody–negative blood)

	Recipients			Unadjusted Hazard Ratio			Adjusted Hazard Ratio		
Risk Factor	Person-time	No. of Recipients	Mortality	Point Estimate	95% CI	*P* Value	Point Estimate	95% CI	*P* Value
Age, years, continuous	428.0	1092	25.9	1.02	1.01–1.03	.04	1.00	.98–1.02	.78
HIV uninfected	377.3	948	17.5	Ref	…	…	Ref	…	…
HIV infected	37.4	112	109.5	5.96	4.03–8.80	.01	6.50	4.33–9.76	<.0001
HIV unknown	13.3	32	30.8	1.80	.67–4.94	.25	2.13	.77–5.91	.14
Not pretransfusion anemic	6.6	17	30.1	Ref	…	…	Ref	…	…
Pretransfusion anemic	304.3	791	28.0	0.89	.22–3.60	.87	1.43	.33–6.16	.63
Unknown anemia status	117.1	284	20.5	0.65	.16–2.81	.58	1.17	.26–5.22	.84
Transfused for malaria	359.3	912	22.5	Ref	…	.01	Ref	…	.06
Transfused for other reasons	68.8	180	43.6	1.92	1.26–2.97		1.64	.97–2.78	
Number of transfusions (continuous)	428.0	1328[a]	25.9	1.55	1.35–1.79	.01	1.60	1.36–1.88	<.0001
Transfused with									
HHV-8-seronegative blood	243.6	621	20.1	Ref	…	…	Ref	…	…
HHV-8-seropositive blood stored >4 days	107.2	271	26.0	1.30	.82–2.69	.27	1.15	.71–1.86	.58
HHV-8-seropositive blood stored ≤4 days	77.6	200	44.2	2.18	1.41–3.37	.01	1.92	1.21–3.05	.01

Person-time in years. Mortality expressed as number of deaths per 100 person-years, Hazard ratios: the hazard of death among patients by differing characteristic. *P* values apply to differences in the hazards observed.

Abbreviations: CI, confidence interval; HIV, human immunodeficiency virus.

[a] Refers to number of transfusions (rather than recipients).

the overall number of transfusions. In this model, too, short-stored HHV-8 antibody–positive blood was associated with an increased risk for death (AHR for each additional transfusion, 1.79; 95% CI, 1.33–2.41; $P = .0001$), whereas the AHR for each additional long-stored HHV-8 antibody–positive transfusion (1.23), short-stored HHV-8 antibody–negative transfusion (1.11), and long-stored HHV-8 antibody–negative transfusion (1.18) was nonsignificant. When replacing the number of transfusions with the number of blood units transfused in the model shown in Table 2, the AHR for exposure to short-stored HHV-8 antibody–positive blood remained significant (AHR, 2.25; 95% CI, 1.44–3.53; $P < .001$), and each additional blood unit transfused carried a significant risk for death (AHR, 1.19; 95% CI, 1.06–1.34; $P = .004$), similar to the number of transfusions. When including both the number of blood units and the number of transfusions in the same main model, HIV infection, additional transfusions during follow-up (AHR, 2.76), and exposure to short-stored HHV-8 antibody–positive blood (AHR, 1.76) remained significant predictors for death, whereas each additional blood unit (of any HHV-8 antibody status) transfused was associated with a decreased risk of death (AHR, 0.67; 95% CI, .48–.92; $P = .014$).

Stratifying the analysis by the major reason for transfusion did not alter the point estimate of association but led to wide confidence intervals for the AHR in each strata (data not shown). We detected no significant effect related to age, illness leading to transfusion, or blood product type transfused on the association between exposure and death. We estimated the median adjusted population attributable fraction of mortality due to short-stored HHV-8 antibody–positive blood to be 13.7% (95% CI, 2.9%–23.4%), which decreased from 16.9% at the beginning of follow-up to 11.0% at the end of follow-up.

We excluded deaths occurring within the first week following transfusion. During this time period, a total of 104 deaths occurred, with a median time to death of 2 days (IQR, 1–4 days). Transfusion of HHV-8 antibody–positive blood was not associated with an increased risk of death within these 7 days (overall: AHR, 0.95; $P = .83$; for short-stored HHV-8 antibody–positive blood: AHR, 0.61; $P = .23$; and for long-stored HHV-8 antibody–positive blood: AHR, 1.14; $P = .61$). Confounding by passive antibody transfer made it difficult to identify active HHV-8 seroconversions among the deceased. Three active HHV-8 seroconvertors were identified (2 recipients of short-stored HHV-8 antibody–positive blood, 1 recipient of long-stored HHV-8 antibody–positive blood, none in

Table 3. Risk Factors for Post-Transfusion Mortality, N = 1074 (human herpesvirus 8 [HHV-8] reference group: transfused with short-stored HHV-8 antibody–negative blood)

	Adjusted Hazard Ratio		
Risk Factor	Point Estimate	95% CI	*P* Value
Age, years, continuous	1.00	.98–1.02	.90
HIV uninfected	Ref	…	…
HIV infected	6.61	4.40–9.93	<.0001
HIV unknown	2.29	.83–6.35	.11
Not pretransfusion anemic	Ref	…	…
Pretransfusion anemic	1.55	.36–6.71	.56
Unknown anemia status	1.31	.29–5.89	.72
Transfused for malaria	Ref	…	.06
Transfused for other reasons	1.67	.98–2.83	
Number of transfusions (continuous)	1.57	1.33–1.86	<.0001
Transfused with			
HHV-8 Ab–negative blood stored ≤4 d	Ref	…	…
HHV-8 Ab–negative blood stored >4 d	1.51	.83–2.75	.18
HHV-8 Ab–positive blood stored >4 d	1.45	.78–2.72	.24
HHV-8 Ab–positive blood stored ≤4 d	2.39	1.30–4.42	.005

Hazard ratios: the hazard of death among patients by differing characteristic. *P* values apply to differences in the hazards observed.

Abbreviations: Ab, antibody; CI, confidence interval; HIV, human immunodeficiency virus.

the unexposed group), which was insufficient for further analysis.

DISCUSSION

In this study, recipients of HHV-8 antibody–positive blood stored ≤4 days had a 1.9-fold greater risk of death than recipients of HHV-8 antibody–negative blood. The risk of death increased with each additional unit of short-stored HHV-8 antibody–positive blood transfused; in contrast, unexposed recipients experienced no additional risk from receipt of additional HHV-8 antibody–negative units regardless of their storage time.

We note several study limitations. We were unable to collect extensive information on the causes of death. Due to the observational study design, study participants were not truly randomized to the different exposure categories. However, this was unlikely to have biased our results because we adjusted for the number of transfusions received throughout the observation period. Also, the mortality risk remained when we restricted analysis to recipients without repeat transfusions during follow-up, and it remained when we right-censored both exposed and unexposed in the same fashion (ie, upon receipt of an HHV-8 antibody–positive transfusion during follow-up).

Our adjusted analysis accounted for several confounders, some of which remained significant in our model. However, several observations support the hypothesis of an exposure-related risk of death. First, the mortality risk was significant only for transfusion with short-stored blood. This is consistent with our earlier finding that most transfusion-associated HHV-8 infections were likely due to short-stored HHV-8 antibody–positive blood [6] and a similar infection risk differential is known for other infectious agents (eg, cytomegalovirus) [8, 9]. Further, the increased mortality risk for each additional short-stored HHV-8 antibody–positive blood unit transfused suggests a dose-response relationship between exposure and subsequent death that was not observed for HHV-8 antibody–negative units and remained after controlling for the total number of transfusions. Lastly, the absence of an exposure-related risk of death during the first 7 days following transfusion indirectly supports our hypothesis because a causal association between transfusion of HHV-8 antibody–positive blood and post-transfusion death would likely take time to manifest itself and suggests that at the time of the baseline transfusion recipients of HHV-8 antibody–positive blood were not more acutely ill than others.

The adjusted estimated attributable risk of death due to transfusion with short-stored HHV-8 antibody-positive blood implies that approximately 5 (95% CI, 1.0–8.0) of the 34 deaths among recipients of short-stored HHV-8-antibody-positive blood or 4.2% of all 111 deaths may have been due to transfusion of short-stored HHV-8 antibody-positive blood. The association with mortality could be due to transfusion-associated HHV-8 being rapidly and highly pathogenic in some patients or to a different infectious agent or other hazard associated with HHV-8 seropositivity. We previously estimated the excess HHV-8 infection risk due to transfusion of short-stored HHV-8-antibody-positive blood alone as 4.2% (95% CI, .1–8.3) [6], or approximately 13 excess HHV-8 infections in this cohort. Among exposed patients who completed >4 weeks of follow-up before dying, there was no serological evidence of HHV-8 infection. However, some individuals may have died of acute illness before seroconversion would have been detected in the context of our sampling intervals. Acute disease has been associated with HHV-8 infection in both immunocompetent [10, 11] and immunocompromised persons, including well-documented severe disease in HIV-infected patients and organ transplant recipients [12–15]. All of our study participants were sufficiently ill to require transfusion; their immune status may have been further compromised by the immunosuppressive effects of transfused blood [16], especially if it

contained allogeneic leukocytes [17, 18]. Thus, it is plausible that HHV-8 itself directly contributed to the observed mortality. Additional research that considers cause of death, HHV-8 DNA in donors and recipients, or the effect of leukoreduction or irradiation on the outcome of transfused short-stored HHV-8 antibody–positive blood in transfusion recipients may clarify the association of HHV-8 with mortality among transfusion recipients.

In conclusion, transfusion of short-stored HHV-8 antibody–positive blood was associated with increased risk of death during the 2–28 weeks following transfusion. If this association is confirmed, blood transfusion systems in HHV-8 endemic areas will face a dilemma. Donated blood is a scarce resource in most countries, particularly in sub–Saharan Africa; removal of HHV-8 antibody–positive blood would further exacerbate existing shortages. The benefits of transfused blood will need to be weighed against its known and potential adverse effects.

Notes

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W. H. had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy the data analysis. P. E. P., W. H., R. D., and J. M. were responsible for the study concept and design. D. M., W. H., and E. N. were responsible for the acquisition of data. L. P., J. H., H. G., D. M., and W. H. analysed and interpreted the data. W. H., J. M., and P. E. P. drafted the manuscript. W. H., J. M., P. E. P., E. N., R. D., and J. H. critically revised the manuscript for important intellectual content. J. H., L. P., and H. G. provided statistical analysis. W. H. obtained funding. J. M. and W. H. provided administrative, technical, or material support.

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Potential conflicts of interest. All authors: No reported conflicts.

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