The number of hospitalized patients receiving treatment perceived to be futile is not insignificant. Blood products are valuable resources that are donated to help others in need. We aimed to quantify the amount of blood transfused into patients who were receiving treatment that the critical care physician treating them perceived to be futile. During a 3-month period, critical care physicians in 5 adult intensive care units completed a daily questionnaire to identify patients perceived as receiving futile treatment. Of 1136 critically ill patients, physicians assessed 123 patients (11%) as receiving futile treatment. Fifty-nine (48%) of the 123 patients received blood products after they were assessed to be receiving futile treatment: 242 units of packed red blood cells (PRBCs) (7.6% of all PRBC units transfused into critical care patients during the 3-month study period); 161 (9.9%) units of plasma, 137 (12.1%) units of platelets, and 21 (10.5%) units of cryoprecipitate. Explicit guidelines on the use of blood products should be developed to ensure that the use of this precious resource achieves meaningful goals. Journal of Hospital Medicine 2017;12:739-742. © 2017 Society of Hospital Medicine

**MATERIALS AND METHODS**

Based on a focus group discussion with physicians who cared for critically ill patients, a questionnaire was developed to identify patients perceived as receiving futile critical care. Details of the definition of futile treatment and the core data collection are described in detail elsewhere.3 For each ICU patient under the physician’s care, the attending physician completed a daily questionnaire asking whether the patient was receiving futile treatment, probably futile treatment, or nonfutile treatment. These surveys were administered every day from December 15, 2011, through March 15, 2012, to each critical care specialist providing care in 5 ICUs (medical ICU, neurocritical care ICU, cardiac care unit, cardiothoracic ICU, and a mixed medical-surgical ICU) in 1 academic health system. All clinicians provided informed consent.

Patients were categorized into the following 3 groups: pa-
tients for whom treatment was never perceived as futile; pa-
itients with at least 1 assessment that treatment was probably
futile, but no futile treatment assessments; and patients who
had at least 1 assessment of futile treatment. Hospital and
6-month mortality was abstracted for all patients.

The Division of Transfusion Medicine provided a data-
base of all adult patients during the 3-month study period
who received a transfusion of packed red blood cells (PR-
BCs), apheresis platelets, plasma, or cryoprecipitate (5 unit
prepoled units). This database was merged with the daily
assessments of the appropriateness of critical care. To de-
termin the proportion of blood products that was utilized
for patients receiving inappropriate treatment, we tallied
the blood products infused to these patients after the day
the patient was assessed as receiving probably inappropriate
or inappropriate treatment. The denominator was the total
amount of blood products used by all assessed patients during
the 3-month study period.

This study was approved by the University of California
Los Angeles Institutional Review Board (IRB# 11-002942-
CR-00004).

RESULTS
During the 3-month study period, 36 critical care clinicians
in 5 ICUs provided care to 1193 adult patients. After ex-
cluding boarders in the ICUs and missed and invalid assess-
ments, 6916 assessments were made on 1136 patients. Of
these 1136 patients, 98 (8.6%) patients received probably
futile treatment and 123 (11%) patients received futile
treatment according to the physicians caring for them.

For patients who were never rated as receiving futile treat-
ment, the in-hospital mortality was 4.6% and the 6-month
mortality was 7.3%. On the contrary, 68% of the patients
who were perceived to receive futile ICU treatment died
before hospital discharge and 85% died within 6 months;
survivors remained in severely compromised health states.¹

Of 1136 patients, 595 (52.4%) patients received at least
1 unit of blood product infusion during the 3-month period.
These patients received 3179 units of PRBCs, 1624 units of
plasma, 1130 units of platelets, and 201 units of cryoprecip-
itate. Of the 123 patients assessed as receiving futile critical
care, 59 (48.0%) patients received blood product infusions
during the study period after they were assessed as receiv-
ing futile treatment. Eighteen of these patients (30.5%) were
in surgical ICUs and 41 (69.5%) were in medical and
neuro-ICUs. After being classified as receiving futile criti-
cal care, these patients were transfused 242 units of PRBCs,
which was 7.6% of the PRBCs received by the study cohort.
The mean number of blood products (PRBC, fresh frozen
plasma, platelet, or cryoprecipitate) transfused per patient
was 9.8 units (range 1-80) with 56% of patients receiving
less than 4 units. Patients assessed as receiving futile treat-
ment also received 161 (9.9%) units of plasma, 137 (12.1%)
units of platelets, and 21 (10.5%) units of cryoprecipitate
(Table, which also shows the amount of blood utilized after
the patient had an assessment of probably futile treatment).
Patients who received blood products after they were as-
essed as receiving futile treatment had a 6-month mortality
of 95%. The figure shows the derivation of the study sample,
blood products received and patient outcomes.

DISCUSSION
Blood and blood products are donated resources. These bio-
logical products are altruistically given with the expectation
that they will be used to benefit others.¹ It is the clinicians’
responsibility to use these precious gifts to achieve the goals
of medicine, which include curing, preserving function, and
preventing clinical deterioration that has meaning to
the patient. Our study shows that a small, but not insignifi-
cant, proportion of these donated resources are provided to
hospitalized patients who are perceived as receiving futile
critical care. That means that these transfusions are used as
part of the critical care interventions that prolong the dying
process and achieve outcomes, such as existence in coma,
which few, if any, patients would desire. However, it should
be noted that some of the health states preserved, such as
neurological devastation or multi-organ failure with an in-
ability to survive outside an ICU, were likely desired by pa-
patients’ families and might even have been desired by patients
themselves. Whether blood donors would wish to donate

<table>
<thead>
<tr>
<th>Blood Product</th>
<th>Units Transfused During 3-Month Period</th>
<th>Units Transfused after Patient Assessed as Receiving Probably Futile Treatment*</th>
<th>Units Transfused after Patient Assessed as Receiving Futile Treatment</th>
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</thead>
<tbody>
<tr>
<td>Packed red blood cells</td>
<td>3179</td>
<td>347 (10.9%)</td>
<td>242 (7.6%)</td>
</tr>
<tr>
<td>Fresh frozen plasma</td>
<td>1624</td>
<td>243 (15%)</td>
<td>161 (9.9%)</td>
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<tr>
<td>Platelets</td>
<td>1130</td>
<td>189 (16.7%)</td>
<td>137 (12.1%)</td>
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<tr>
<td>Cryoprecipitate</td>
<td>201</td>
<td>24 (11.9%)</td>
<td>21 (10.5%)</td>
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</table>

*Because patients usually were assessed as receiving probably futile treatment before being assessed as receiving futile treatment, blood products received after a patient was assessed as receiving futile treatment (column 3) is a subset
of blood products received after a patient was assessed as receiving futile treatment (column 2).

NOTE. Percentages in parenthesis refer to proportion of product usage by patients who were perceived as receiving futile critical care.
blood to preserve life in such compromised health states is testable. This proportion of blood provided to ICU patients perceived as receiving futile treatment (7.6%) is similar to or greater than that lost due to wastage, which ranges from 0.1% to 6.7%.\(^{14}\) While the loss of this small proportion of blood products due to expiration or procedural issues is probably unavoidable, but should be minimized as much as possible, the provision of blood products to patients receiving futile critical care is under the control of the healthcare team. This raises the question of how altruistic blood donors would feel about donating if they were aware that 1 of every 13 units transfused in the ICU would be given to a patient that the physician feels will not benefit. In turn, it raises the question of whether the physician should refrain from using these blood products for patients who will not benefit in accordance with principles of evidence-based medicine, in order to ensure their availability for patients that will benefit.

This study has several limitations. Family/patient perspectives were not included in the assessment of futile treatment. It should also be recognized that the percentage of blood products provided to patients receiving inappropriate critical care is likely an underestimate as only blood product use during the 3-month study period was included, as many of these patients were admitted to the ICU prior the study period, and/or remained in the ICU or hospital after this window.

**CONCLUSIONS**

Similar to other treatments provided to patients who are perceived to receive futile critical care, blood products represent a healthcare resource that has the potential to be used

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**FIG.** Derivation of the study sample, the blood products received and patient outcomes. Shaded boxes show transfusions that occurred after a patient was assessed as receiving probably futile or futile treatment. NOTE: Abbreviations: cryo, cryoprecipitate; m, month; Plt, platelet; PRBC, packed red blood cells

<table>
<thead>
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<th>Plts</th>
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<td>1095</td>
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without achieving the goals of medicine. But unlike many other medical treatments, the ability to maintain an adequate blood supply for transfusion relies on altruistic blood donors, individuals who are simply motivated by a desire to achieve a healthcare good. Explicit guidelines on the use of blood products should be developed to ensure that the use of this precious resource achieves meaningful goals. These goals need to be transparently defined such that a physician's decision to not transfuse is expected as part of evidence-based medicine. Empiric research, educational interventions, and clearly delineated conflict-resolution processes may improve clinicians' ability to handle these difficult cases.

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