

ASSESSMENT OF TRANSFUSION-RELATED ACUTE LUNG INJURY (TRALI) AFTER BLOOD TRANSFUSION



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INTRODUCTION

- The FDA’s Sentinel Initiative is an active surveillance system that uses routine querying tools and pre-existing electronic healthcare data from multiple sources to monitor the safety of regulated medical products.
- The Blood Safety Surveillance Continuous Active Network (BloodSCAN) was created by the Center for Biologics Evaluation and Research (CBER) as a subcomponent of the Sentinel Initiative to monitor recipient safety of US FDA-regulated blood components and blood-derived products.
- In 2016, inpatient Electronic Medical Record (EMR) transfusion data were added to the Sentinel network, providing new safety surveillance potential for BloodSCAN.

BACKGROUND

- Transfusion-Related Acute Lung Injury (TRALI), an adverse event occurring during or within 6 hours of transfusion, is a leading cause of transfusion-associated fatalities reported to the U.S. Food and Drug Administration.¹

1. US Food and Drug Administration, Center for Biologics Evaluation & Research. Fatalities reported to FDA following blood collection and transfusion: annual summary for fiscal year 2016. [cited 2018 June]. <https://www.fda.gov/downloads/BiologicsBloodVaccines/SafetyAvailability/ReportaProblem/TransfusionDnationFatalities/UCM598243.pdf>

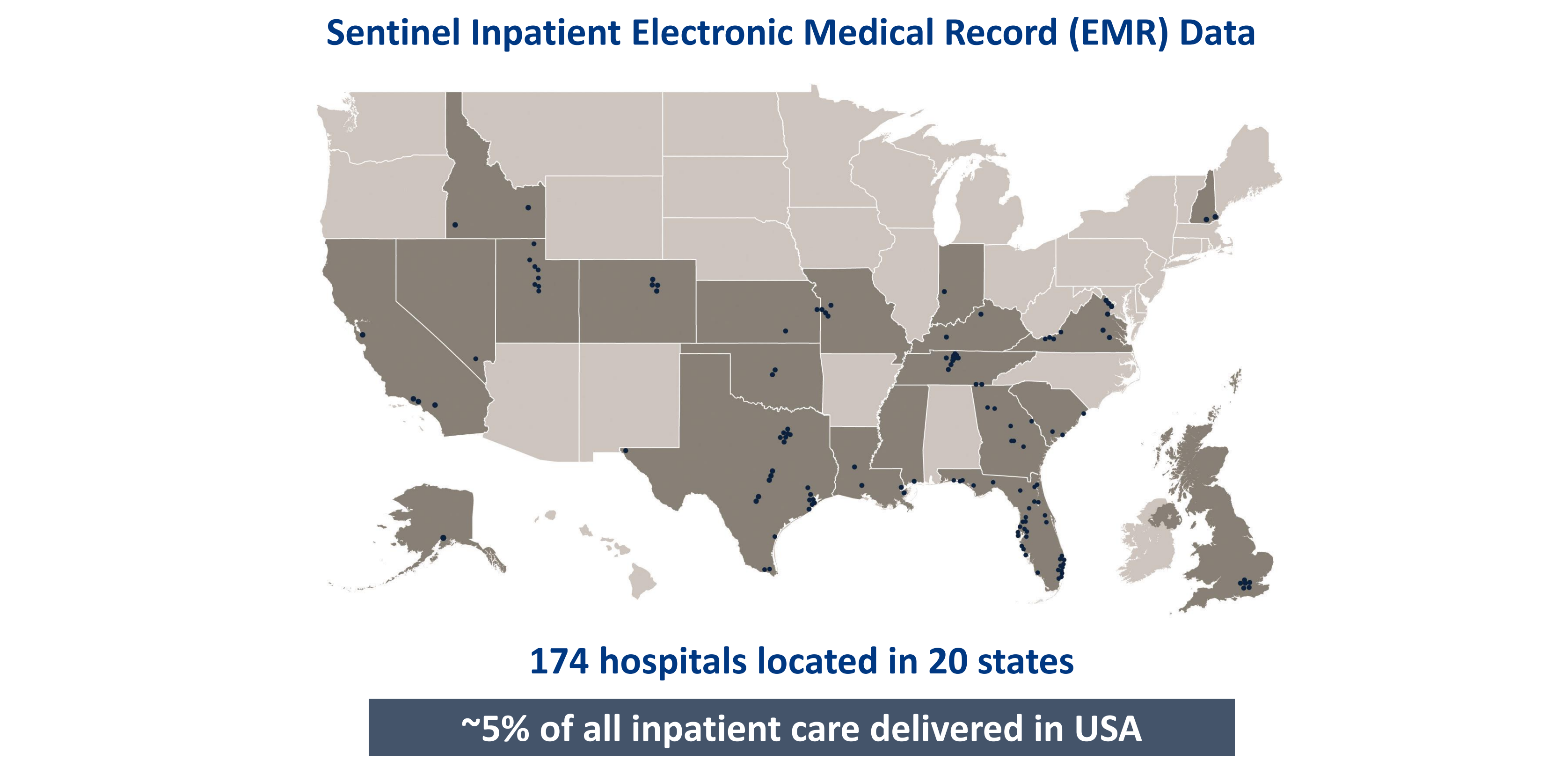
OBJECTIVE

To assess TRALI occurrence and potential risk factors among patients transfused in an inpatient setting.

METHODS

Design and Population

We conducted a retrospective cohort study among transfused patients using Sentinel inpatient EMR data during 2013-2015.



Data

Potential TRALI cases were identified with ICD-9-CM codes (Table 1) and transfusions with ISBT-128 and Codabar codes. TRALI diagnosis was validated with medical records.

Table 1. Electronic criteria to identify potential cases of TRALI	
Criterion A	TRALI, ICD-9-CM code in any position (518.7)
Criterion B	Acute respiratory failure ICD-9-CM code in any position (518.81), WITH code for a blood transfusion reaction (999.80 or 999.89 or E934.7)
Criterion C	Other pulmonary insufficiency (518.82), WITH code for a blood transfusion reaction (999.80 or 999.89 or E934.7)

Analyses

Using criteria in Table 1, we identified potential TRALI cases with and without transfusions captured in electronic data for chart review.

For analyses utilizing only electronic data, we defined TRALI with its specific ICD-9-CM code (Criterion A), and calculated unadjusted TRALI occurrence rates per 100,000 inpatient transfusion stays and 95% confidence intervals (CI) overall, by year, age, discharge status, mechanical ventilation (MV) use, blood components, and number of units transfused. TRALI rates were compared using unadjusted rate ratios, and corresponding chi-square or Fisher’s exact tests (for small cell counts).

Finally, we ascertained an unadjusted mean TRALI rate per 100,000 transfused inpatient stays using only cases validated with medical charts.

RESULTS

- Among almost 4 million inpatient stays, there were 353,749 inpatient transfusion stays and 208 potential TRALI stays; 118 had a TRALI specific ICD-9-CM code (518.7).
- When the population was restricted to transfused inpatient stays and TRALI was defined by its specific ICD-9-CM code (Table 2):
- Of 353,666 inpatient transfusion stays, 109 had a TRALI specific ICD-9-CM code.
- The overall TRALI rate was 30.8 (CI, 25.0-36.6) per 100,000 transfusion stays.
 - Annual TRALI rates in 2013-2015 were 33.7, 28.1, and 33.6 respectively.
 - Patients over 65 years had lower TRALI rates than other age groups.
 - TRALI rates were high in patients discharged expired or requiring MV.
 - TRALI occurrence increased with greater number of transfused units.
 - Patients exposed to multiple blood components had higher TRALI rates.
- When TRALI was confirmed with medical records:
 - The overall rate was 19.2 (CI, 14.7-23.8) per 100,000 transfusion stays.

Table 2. Comparison of unadjusted mean TRALI rates by year, blood components, demographic characteristics, and transfused units among inpatient transfusion stays in the Sentinel database, September 2013- September 2015			
Categories	Unadjusted TRALI rate per 100,000 transfusion stays (95%, CI†)	Unadjusted rate ratio* (95% CI†)	p-value
Admission year‡			
2013 (reference, [R])	33.7 (17.2-50.1)	R	R
2014	28.1 (20.4-35.9)	0.84 (0.48-1.47)	0.531
2015	33.6 (23.5-43.8)	1.00 (0.56-1.78)	0.999
Discharge disposition			
Discharged alive [R]	24.8 (19.4-30.2)	R	R
Discharged expired	117.4 (73.1-161.6)	4.73 (3.06-7.31)	<.0001
Age category			
<1-19 years	44.3 (8.9-79.8)	0.97 (0.37-2.55)	0.950
20-34 years [R]	46.0 (20.9-70.5)	R	R
35-49 years	44.6 (23.4-65.7)	0.98 (0.47-2.01)	0.945
50-64 years	35.8 (22.8-48.9)	0.78 (0.41-1.51)	0.465
65-79 years	23.5 (14.7-32.4)	0.51 (0.27-1.00)	0.045
80+ years	21.9 (11.5-32.3)	0.48 (0.23-0.99)	0.041
Sex			
Male	31.1 (22.3-39.9)	1.02 (0.70-1.49)	0.930
Female [R]	30.6 (22.9-38.3)	R	R
Mechanical ventilation (MV)			
MV=Yes	123.8 (94.0-153.7)	8.65 (5.89-12.70)	<.0001
MV=no [R]	14.3 (10.0-18.6)	R	R
Blood component groups			
Red blood cells (RBC) only [R]	18.6 (13.3-23.9)	R	R
Platelets (PLT) only	25.8 (3.4-55.0)	1.39 (0.43-4.46)	0.623
Plasma only	12.3 (4.8-29.4)	0.66 (0.16-2.74)	0.569
PLTs and Plasma only	103.5 (40.0-247.0)	5.58 (1.36-22.94)	0.053
RBCs and Plasma only	49.9 (17.3-82.5)	2.69 (1.32-5.48)	0.011
RBCs and PLTs only	74.8 (36.9-112.6)	4.03 (2.25-7.20)	<.0001
RBCs and Plasma and PLTs only	130.2 (56.5-203.8)	7.01 (3.72-13.21)	<.0001
Other transfusion combination§	241.2 (126.6-355.9)	13.00 (7.47-22.62)	<.0001
Transfusion type unknown	12.3 (4.8-29.2)	0.66 (0.16-2.72)	0.769
Number of transfused units			
1 unit [R]	8.4 (2.2-14.7)	R	R
2-4 units	19.2 (13.2-25.1)	2.27 (1.02-5.07)	0.039
5-9 units	56.8 (34.1-79.5)	6.73 (2.90-15.62)	<.0001
>9 units	191.9 (130.9-252.9)	22.75 (10.16-50.95)	<.0001

* Unadjusted rate ratios compare TRALI risk within each specific category versus reference category
† Confidence interval
§ Any other transfusion combination besides listed categories (e.g., included cryoprecipitate)
|| Transfusion record existed in electronic data, but codes could not be mapped to specific component

CONCLUSION

- TRALI rates increased as the number of transfused units increased
- Higher risk of TRALI was identified with PLTs transfused in combination with RBCs and/or Plasma.
- Further investigation of results within validated TRALI cases is warranted.

ACKNOWLEDGEMENTS/DISCLOSURES

- This work was supported by the FDA through the Department of Health and Human Services (HHS) Contract numbers HHSF223201400030I and HHSF223200910006I
- The views expressed are solely those of the co-authors involved, and do not represent those of the FDA.
- The authors have no conflicts of interest to disclose