

VA



U.S. Department
of Veterans Affairs

Blast Injury and Cardiopulmonary Symptoms in US Veterans

An analysis of VA/DoD Airborne Hazards & Open Burn Pit Registry (AHOBPR)



PRESENTATION DETAILS

- **Presented by Drew A. Helmer, MD, MS**
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 - Airborne Hazards Center of Excellence team
- **Gulf War Research Advisory Committee**
 - Wednesday, March 21, 2018
 - Fort Lauderdale, FL
- **The views contained here are Dr. Helmer's and do not represent the official position or policies of the Federal Government**
- **Dr. Helmer has no conflicts to disclose.**



OBJECTIVES

- Summarize key features of Jani et al, “Blast Injury and Cardiopulmonary Symptoms in U.S. Veterans: Analysis of a National Registry”
 - [Ann Intern Med.](#) 2017 Nov 21;167(10):753-755. doi: 10.7326/M17-0711. Epub 2017 Sep 19.
- Provide an overview of other analyses of AHOBPR data
- Provide an overview of the utility of AHOBPR in clinical and surveillance activities



ORIGINS OF THE “BLAST PAPER”

- **Clinical observation**
 - Bradford-Hill tenets of causality
- **What data were available?**
 - AHOBPR
 - What other research was ongoing?
- **Attributes of the AHOBPR**
 - Strengths/limitations → study design
 - Analyses and presentation
- **Collaborative review process**



RESULTS

LETTERS

Table. Characteristics of Registry Participants Deployed After 7 October 2001*

Characteristic	All Participants (n = 42 558)	Self-reported Blast Exposure			
		Yes (n = 31 372)	No (n = 10 074)	Do Not Know (n = 699)	Do Not Wish to Answer (n = 413)
Age, n (%)					
≤20 y	10 (0)	6 (0)	3 (0)	1 (0.1)	0 (0)
21-40 y	27 167 (63.8)	20 278 (64.6)	6149 (61.0)	429 (61.4)	311 (75.3)
41-60 y	15 038 (35.3)	10 872 (34.7)	3803 (37.8)	263 (37.6)	100 (24.2)
≥61 y	343 (0.8)	216 (0.7)	119 (1.2)	6 (0.9)	2 (0.5)
Sex, n (%)					
Male	38 217 (89.8)	28 687 (91.4)	8593 (85.3)	575 (82.3)	362 (87.7)
Female	4341 (10.2)	2685 (8.6)	1481 (14.7)	124 (17.7)	51 (12.3)
Branch of service, n (%)					
Air Force	8194 (19.3)	5007 (16.0)	2922 (29.0)	193 (27.6)	72 (17.4)
Army	27 482 (64.6)	21 500 (68.5)	5355 (53.2)	383 (54.8)	244 (59.1)
Coast Guard	138 (0.3)	40 (0.1)	90 (0.9)	6 (0.9)	2 (0.5)
Marines	4668 (11.0)	3620 (11.5)	910 (9.0)	67 (9.6)	71 (17.2)
Navy	2076 (4.9)	1205 (3.8)	797 (7.9)	50 (7.2)	24 (5.8)
Body mass index, n (%)†					
Underweight (<18.5 kg/m ²)	304 (0.7)	218 (0.7)	80 (0.8)	4 (0.6)	2 (0.5)
Normal (18.5-24.9 kg/m ²)	7027 (16.5)	4902 (15.6)	1910 (19.0)	135 (19.3)	80 (19.4)
Overweight (25.0-29.9 kg/m ²)	20 716 (48.7)	15 162 (48.3)	5002 (49.7)	356 (50.9)	196 (47.5)
Obese (≥30.0 kg/m ²)	13 415 (31.5)	10 272 (32.7)	2827 (28.1)	193 (27.6)	123 (29.8)
Missing	1096 (2.6)	818 (2.6)	255 (2.5)	11 (1.6)	12 (2.9)
Smoking status, n (%)‡					
Never	24 196 (56.9)	17 267 (55.0)	6287 (62.4)	397 (56.8)	245 (59.3)
Past	11 579 (27.2)	8762 (27.9)	2585 (25.7)	157 (22.5)	75 (18.2)
Current	4930 (11.6)	3905 (12.4)	902 (9.0)	83 (11.9)	40 (9.7)
Other	1853 (4.4)	1438 (4.6)	300 (3.0)	62 (8.9)	53 (12.8)
Nonmilitary occupation involving exposure to dust, n (%)					
Yes	5064 (11.9)	3759 (12.0)	1200 (11.9)	66 (9.4)	39 (9.4)
No	36 400 (85.5)	26 827 (85.5)	8647 (85.8)	586 (83.8)	340 (82.3)
Do not wish to answer	321 (0.8)	230 (0.7)	56 (0.6)	10 (1.4)	25 (6.1)
Do not know	773 (1.8)	556 (1.8)	171 (1.7)	37 (5.3)	9 (2.2)
Nonmilitary occupation involving exposure to gas, smoke, chemical vapors, or fumes, n (%)					
Yes	7201 (16.9)	5334 (17.0)	1724 (17.1)	88 (12.6)	55 (13.3)
No	32 538 (76.5)	23 968 (76.4)	7767 (77.1)	501 (71.7)	302 (73.1)
Do not wish to answer	426 (1.0)	317 (1.0)	78 (0.8)	7 (1.0)	24 (5.8)
Do not know	2393 (5.6)	1753 (5.6)	505 (5.0)	103 (14.7)	32 (7.7)
Current dyspnea and/or decreased exercise tolerance, n (%)					
Yes	25 974 (61.0)	20 512 (65.4)	4764 (47.3)	436 (62.4)	262 (63.4)
No	16 584 (39.0)	10 860 (34.6)	5310 (52.7)	263 (37.6)	151 (36.6)
Cumulative days deployed					
Mean (SD)	449.5 (287.6)	476.8 (296.0)	373.3 (247.4)	385.3 (247.6)	380.3 (244.0)
Median (range)	365 (1-4174)	393 (1-4174)	315 (1-3998)	320 (1-3299)	345 (1-3134)
Time between last deployment and start of questionnaire, mo					
Mean (SD)	62.2 (37.2)	63.7 (37.0)	58.2 (37.4)	65.3 (37.7)	63 (36.5)
Median (range)	57 (0-162)	59 (0-162)	54 (0-162)	61 (0-152)	61 (0-154)
Burn-pit exposure, n (%)§					
Yes	34 637 (81.4)	26 640 (84.9)	7218 (71.6)	479 (68.5)	300 (72.6)
Quartile 1 (1-1487 cumulative hours)	8628 (24.9)	5849 (21.9)	2516 (34.9)	164 (34.2)	100 (23.3)
Quartile 2 (1488-3338 cumulative hours)	8670 (25.0)	6440 (24.2)	2055 (28.5)	120 (25.1)	56 (18.7)
Quartile 3 (3339-6663 cumulative hours)	8679 (25.0)	6829 (25.6)	1650 (22.9)	103 (21.5)	98 (23.7)
Quartile 4 (6664-97 152 cumulative hours)	8660 (25.0)	7524 (28.2)	997 (13.8)	92 (19.2)	48 (16.0)
No	687 (1.6)	284 (0.9)	390 (3.9)	9 (1.3)	4 (1.0)
Do not wish to answer	527 (1.2)	367 (1.2)	121 (1.2)	23 (3.3)	16 (3.9)
Do not know	6707 (15.8)	4081 (13.0)	2345 (23.3)	191 (27.3)	90 (21.8)

* Percentages may not sum to 100 due to rounding.

† Calculated from self-reported height and weight. Respondents reporting height <147.32 cm or >203.20 cm were excluded because these are not consistent with military height requirements.

‡ Categorized as never (reported smoking <100 cigarettes per lifetime), past (reported smoking ≥100 cigarettes per lifetime but not current smoking), current (reported smoking every day or some days), or other (responded "Do not know" or "Do not wish to answer") and constructed from several items.

§ Cumulative hours were defined as the sum of the hours of exposure on a typical day for each deployment multiplied by the number of days for each deployment.



HYPOTHESIS-GENERATING CONCLUSION

multivariate model, controlling for the following potential self-reported confounders: age; sex; branch of service; body mass index; smoking status; exposure to burn-pit smoke; nonmilitary occupational exposure to dust, gas, smoke, chemical vapors, or fumes; and time since deployment. Missing data for burn-pit smoke exposure (17% of records) were estimated using multiple imputation (PROC MI FCS discriminant method [SAS Institute], with 25 imputed data sets and 2 auxiliary variables associated with burn-pit exposure included in the imputation model). We observed an association between current symptoms and self-reported blast exposure (adjusted odds ratio, 1.66 [95% CI, 1.5 to 1.7]), controlling for the covariates.

Conclusion: We found a moderate, independent association between self-reported blast exposure and current symptoms of dyspnea and/or decreased exercise tolerance in U.S. military service members who were deployed after 7 October 2001 and had completed the AHOBPR. Our findings are biologically plausible and supported by animal studies showing impaired cardiopulmonary function secondary to blast injury (4). Further, this study corroborates a report of increased risk for chronic lung disease among deployed veterans of the wars in Iraq and Afghanistan with a history of traumatic brain injury—a potential proxy for blast exposure (2).



“BLAST PAPER” - IMPLICATIONS AND IMPACT

- Evidence for a ‘missing’ risk factor
- Corroboration required
 - Interest in funding additional research
 - Exploration of other data
- Clinical exploration of blast effects besides TBI
- Proof of concept of value of AHOBPR
 - First online VA/DoD registry
 - 0 to 134,000 participants in <4 years
 - Linkable to other datasets



OTHER RESEARCH ANALYSES

- **Burn Pit Emissions Exposure and Respiratory and Cardiovascular Conditions Among Airborne Hazards and Open Burn Pit Registry Participants.**
 - [J Occup Environ Med.](#) 2016 Jul;58(7):e249-55.
- **Self-report of Asthma Diagnosis among Participants in the VA/DoD Airborne Hazards and Open Burn Pit Registry.**
 - Poster Presentation at Canadian Institute for Military and Veterans Health Research (CIMVHR) FORUM 2017 – Toronto, ON, September 24-27, 2017.
- **Self-reports of Constrictive Bronchiolitis among Service Members Participating in the VA/DoD Airborne Hazards and Open Burn Pit Registry.**
 - Poster Presentation at CHEST 2017, Toronto, ON, November 1, 2017.
- **Ongoing analysis of sarcoidosis**



SURVEILLANCE- INTERNAL REPORTS

- **Registry report (4March2018)**
 - Cumulative participants- 134,422
 - Pending completion- 62,430
 - Ineligible- 1,438
 - Did not consent- 10,185
- **In-person evaluation report (2March2018)**
 - Number documented by note title
 - 86 VAMCs
 - 2,931 (out of 72,619 who indicated interest)
 - Health factors
 - Documented chief concerns [Top 5 (>50%)]
 - Shortness of breath, chronic sinus infection, runny nose, decreased exercise ability, GI problem)
 - Clinician recognized problems [Top 5 (>30%)]
 - Respiratory, ENT, Mental Health, GI, Musculoskeletal



AHOBPR INITIAL EVALUATIONS

- **In-person evaluation is optional**
- **Note template is available in EMR**
 - Guides scope of evaluation
 - Health Factors to capture data
 - Developed and tested by providers
- **Models for completion of evaluation**
 - Environmental Health Clinicians
 - Primary care clinicians
 - Post-deployment health champions



SURVEILLANCE- BEST PRACTICES

- **El Paso VAMC**
 - Completed 1,453 in-person evaluations
 - Environmental health coordinator and clinician outreach to community
- **Augusta VAMC**
 - Completed 479 in-person evaluations
 - Environmental health coordinator and clinician generate reports from AHOBPR



SURVEILLANCE- ENHANCEMENTS

- **VISN- and VAMC-level reports**
 - # of AHOBPR participants
 - # of AHOBPR initiators
 - # who wanted an in-person evaluation
 - # with an in-person evaluation
 - # with evidence of other evaluation
- **Drill-down to individuals**
- **System-based interventions**



SURVEILLANCE- ENHANCEMENTS

- **AHCE-WRIISC Airborne Hazards Registry (AWARE) Program**
 - Airborne Hazards Center of Excellence (AHCE) at New Jersey WRIISC
 - Priority conditions, subgroups & exposures
 - Constrictive bronchiolitis
 - Other Pulmonary conditions
 - GWV exposure to smoke from burning oil wells
 - Registry data → chart review → telephonic assessment → specialty evaluation
 - Clinical care linked to research protocols



PROGRESSION OF ANALYTIC COMPLEXITY

- **Registry data only (self-report)**
 - Risk factors/Case-Control design
- **Registry data + VHA Corporate Data Warehouse (CDW)**
 - Corroboration of self-report/Healthcare utilization (VHA only)
- **Registry data + CDW + Initial AHOBPR Eval**
 - Clinician input on AHOBPR-specific issues
- **Registry data + CDW + Initial Eval + Special Eval**
 - AWARE program at NJ WRIISC
- **Individual vs. Other units of analyses**
 - Systems-approach to surveillance, outreach, engagement
- **Marginal utility of continuing AHOBPR**
 - Mission accomplished?



CONCLUSIONS

- AHOBPR demonstrates benefits/limitations of a voluntary, self-administered registry
- The “Blast Paper” and other analyses demonstrate the potential for AHOBPR data to increase our understanding
- AHOBPR data are more powerful when used in conjunction with other data
- AHOBPR data can still inform outreach, engagement, and surveillance efforts
 - Systems approaches and adequate resources

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Questions?