



Illicit Substance Use Effects on Burn Related Reconstruction Patient Outcomes and Complications Following Hospital Admission: Systematic Review and Meta-analysis

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ABSTRACT

Summary

Patients suffering from burn-related injuries admitted to the hospital concurrent illicit substance use are believed to be at an increased risk of poor outcomes and the development of complications following burn reconstruction, however data varies within the literature and remains controversial. This systematic review and meta-analysis compared outcomes and complications from studies during the years 1986 to 2017 between 15653 burn patients admitted to the hospital with substance use alcohol use reported by a positive toxicology screen (amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, methadone, codeine/morphine, PCP, LSD, inhalants, solvents, aerosols, legal highs), or the patient on hospital admission to 299543 burn patients admitted who were not using substances. The PubMed, EMBASE, Cochrane Library, and Web of Science databases were systematically and independently searched. Clinical characteristics, illicit substance use, outcomes and complications were recorded. PRISMA and Cochrane guidelines were used throughout the review. Five of the 10 studies included in our study, were eligible for meta-analysis, with results from 8 of the possible 21 outcomes and complications queried. In conclusion, this systematic review and meta-analysis found that compared to patients suffering from burn-related injuries who did not use illicit substance, patients using illicit substances had a higher %TBSA of burns, longer hospital LOS, had a higher rate of intubation, had a higher rate of inhalation injury, longer ICU LOS, and increased wound/local skin infections.

INTRODUCTION

This new systematic review and meta-analysis compared outcomes and complications between substance use in burn patients admitted to the hospital to burn patients admitted without these characteristics. This review is an attempt to compile information to create a uniform set of data for clinical interpretation in diverse populations. Based on peer-reviewed literature, it was hypothesized that substance use would increase the risks of poor outcomes and complications in patients admitted to the hospital following a burn related injury, compared to burn patients admitted without any of these characteristics.

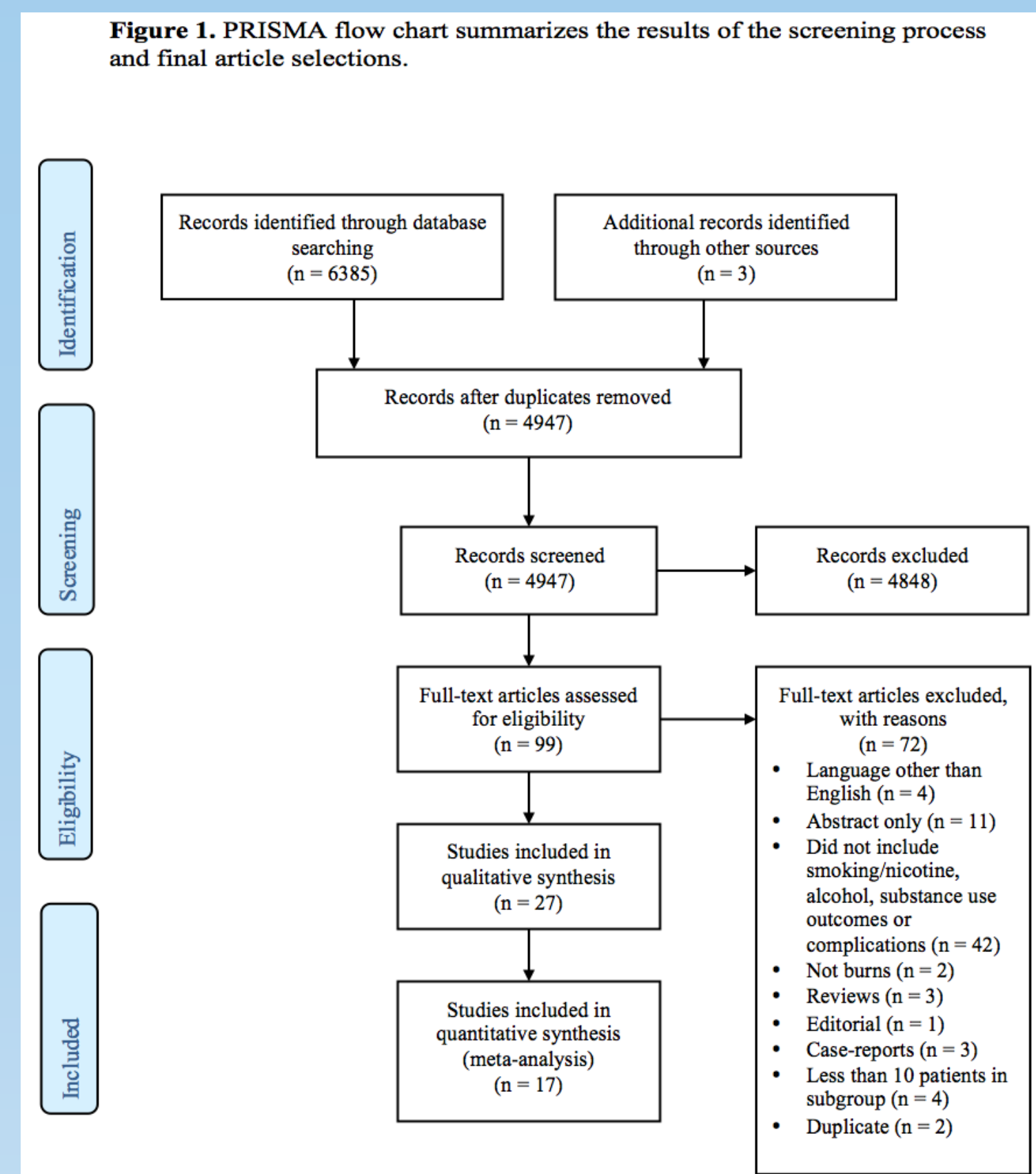
MATERIAL AND METHODS

Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines¹¹ were followed throughout the literature search process to structure the framework for the review.

Table Substance use individual study results

Author	Group	Sample size (n)	Burn related operations (mean)	%TBSA (mean±SD)	LOS (mean±SD)	Ventilator days (mean±SD)	Intubation (n)	Inhalation injury (n)	ICU LOS (mean±SD)	Mortality (n)	Infection (n)	Wound/local infection (n)	DVT/PE (n)
Bell et al.	Substance	31	19	10.3±14	8±9	---	6 days	---	---	0	---	---	---
Danks et al.	Substance	31	14	18.9±21	15.9±19	19.5±27	6 days	---	---	22	11	---	---
Darko et al.	Substance	36	---	---	---	---	---	---	---	3	---	---	---
Heard et al.	Control	478	---	---	---	---	---	---	---	22	---	---	---
	Substance	4352	---	---	---	---	---	---	---	257	257	---	---
Jehle et al.	Control	132283	---	---	---	---	---	---	---	3333	3333	---	---
	Substance	2586	2.8	12	13.3	---	---	---	7.8	---	---	---	---
McGill et al.	Control	7224	2	11	12.6	---	---	---	6.3	---	---	---	---
	Substance	88	---	24±23	---	---	---	25	---	8	---	---	---
Rehou et al.	Control	237	---	17±17	---	---	---	7	---	---	---	---	---
	Substance	205	---	16.3±23	17.6±18	10.6±18	117	63	---	8	---	---	---
Sikora et al.	Control	794	---	7.3±11	11.3±15	8±18	200	77	---	28	---	---	---
	Substance	10	---	---	---	---	---	---	---	---	---	---	2
Warner et al.	Substance	15	---	40	---	---	11	11	---	6	---	---	---
Hodgman et al.	Substance	10972	---	11.2±15	14.2±16	5.3±1	---	---	1096	8.5±9	599	---	---
	Control	9347	---	9.5±10	11.4±13	0	---	773	5.6±3	457	---	---	---

MATERIAL AND METHODS



Search

A medical library informationist (SMS) conducted the initial literature search using four databases (MEDLINE via PubMed, Embase, Cochrane, and Web of Science) from inception to December 20, 2018. Reference lists of relevant articles were hand searched to identify additional relevant studies. All references were imported into Covidence (Veritas Health Innovation Ltd, Melbourne, Australia) and reference management software and duplicates were removed.

Data Extraction

Two reviewers (KMK and PS) systematically and independently performed the title screening, followed by abstract screening, and full-article review to ensure quality and accuracy throughout the process. Any disagreements regarding studies to be included or excluded were resolved by discussion. If disagreements were still present after discussion, a third reviewer (CSH) resolved remaining conflict. The following data were extracted qualitatively and quantitatively for outcome and complication variables of interest: authors, year of publication, type of study, sample size, male and female distributions, substances used on admission to the hospital, burn related operations, graft loss/failure, percent total body surface area burned (%TBSA), depth of burn (superficial, superficial partial thickness, deep partial thickness, full thickness), skin grafting, amputations, length of hospital stay (LOS), time period of wound closure, inhalation injury, number of days on a ventilator, rate of intubation, intensive care unit (ICU) LOS, mortality, overall infections, wound/local skin infections, sepsis, decubitus ulcer (hospital acquired pressure injury), deep vein thrombosis (DVT)/pulmonary embolism (PE), renal failure, respiratory complications, and ventilator-associated events. If there were multiple reports from the same study, one data collection form was completed for the study from all of the reports to avoid duplicating results.

RESULTS

%TBSA

Seven studies evaluated %TBSA.^{5, 6, 9, 18, 20, 25, 32} In three studies, means ranged from 11% to 24% TBSA in patients taking substances compared to 7.3% to 17% TBSA in patients not taking substances. The mean total body surface area in patients taking substances was 0.38 higher (SMD: 0.38, 95% CI: 0.02, 0.74, I² = 95%, p = 0.04).^{5, 6, 9} After removing the study Hodgman et al, heterogeneity dropped from I² = 95% to I² = 69%, with a p = 0.04 to p < 0.0001 (RR: 0.52, 95% CI: 0.26, 0.78, I² = 69%, p < 0.0001).⁹

Hospital LOS

Five studies evaluated hospital LOS.^{6, 9, 18, 20, 25} In two studies, hospital LOS means ranged from 14 to 17.6 days in 11177 patients taking substances compared to 11.3 to 11.4 days in 10141 patients not taking substances. The mean length of hospital stay in patients taking substances was 0.28 longer (SMD: 0.28, 95% CI: 0.08, 0.48, I² = 85%, p < 0.007).^{6, 9}

Ventilator days

Three studies evaluated the number of days patients were on a ventilator.^{6, 9, 20} In two studies, the number of days a patient was on a ventilator means ranged from 5.3 to 10.6 days in patients taking substances compared to 0 to 8 days in patients not taking substances (SMD: 0.28, 95% CI: 0.08, 0.48, I² = Not applicable, p < 0.07).^{6, 9} The lack of patients not taking substances on ventilators in Hodgman et al, did not allow for statistical comparison.⁹

Intubation

Four studies evaluated rates of intubation.^{6, 18, 20, 32} In one study, 117/205 (57%) patients taking substances were intubated compared to 200/794 (25%) patients not taking substances (RR: 2.27, 95% CI: 1.91, 2.68, I² = Not applicable, p < 0.00001).⁶

Inhalation injury

Four studies evaluated patients sustaining inhalation injury.^{5, 6, 9, 32} In three studies, 1184/11265 (11%) patients taking substances sustained an inhalation injury compared to 867/10378 (8%) patients not taking substances (RR: 2.41, 95% CI: 1.06, 5.47, I² = 96%, p < 0.04).^{5, 6, 9} After removing the study Hodgman et al, heterogeneity dropped from I² = 96% to I² = 69%, with a p = 0.04 to p < 0.0001 (RR: 0.52, 95% CI: 0.26, 0.78, I² = 69%, p < 0.0001).⁹

ICU LOS

Two studies evaluated ICU LOS.^{9, 25} In one available study, the mean ICU LOS was 8.5 days in 10972 patients taking substances compared to 5.6 days in 9347 patients not taking substances. The mean length of ICU stay in patients taking substances was 0.43 longer (SMD: 0.43, 95% CI: 0.41, 0.46, I² = Not applicable, p < 0.00001).⁹

Mortality

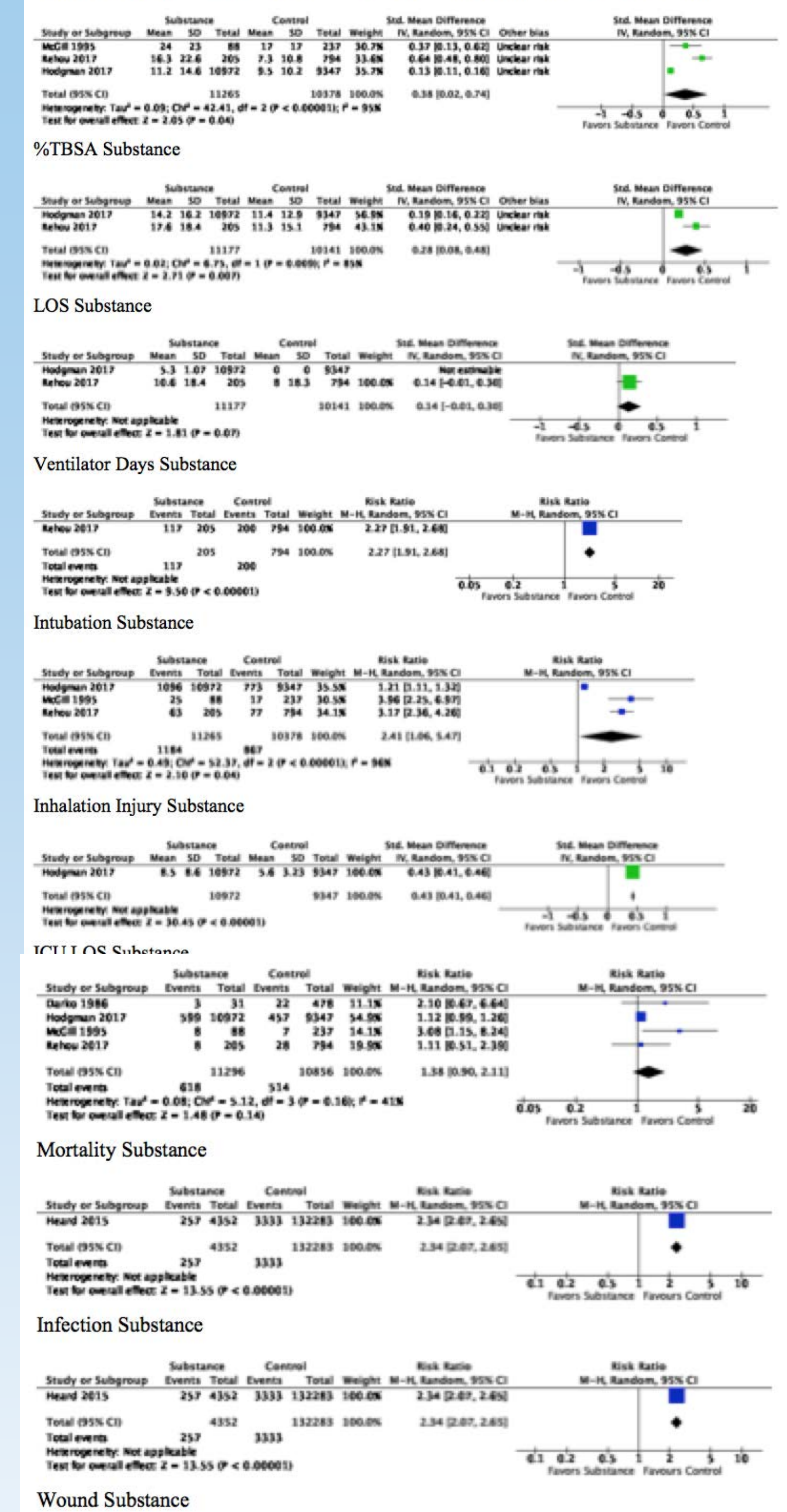
Six studies evaluated mortality.^{5-7, 9, 18, 32} In four studies, mortality occurred in 618/11301 (5.4%) patients taking substances compared to 514/10856 (4.7%) patients not taking substances (RR: 1.38, 95% CI: 0.90, 2.11, I² = 41%, p = 0.14).^{5-7, 9}

Wound/local skin infections

Two studies evaluated wound/local skin infections.^{20, 23} One study found 257/4352 (6%) cellulitis infections in patients taking substances compared to 3333/132283 (2.5%) cellulitis infections in patients not taking substances (RR: 2.34, 95% CI: 2.07, 2.65, I² = Not applicable, p < 0.00001).²³

RESULTS

Figure 3. Forest plots with comparisons of outcomes and complications in meta-analysis



CONCLUSION

Compared to patients suffering from burn-related injuries who did not use illicit substance, patients using illicit substances had a higher %TBSA of burns, longer hospital LOS, had a higher rate of intubation, had a higher rate of inhalation injury, longer ICU LOS, and increased wound/local skin infections.

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