Table S1. Search strategy in PubMed.

	Determinant 1	Determinant 2
Title/abstract	Stem cell transplant HSCT SCT	Vaccin
Mesh-term	Stem cell transplantation	Vaccination

Table S2. Study characteristics and validity of included studies.

Reference	Year	Country	*N*	HSCT
Van der Velden et al[31]	2005	Netherlands	16	Auto
Jaffe et al[35]	2006	United States	168	Allo
Van der Velden et al[45]	2007	Netherlands	20	Auto
Avetisyan et al[12]	2008	Sweden	14	Allo
Pao et al[40]	2008	United States	76	Allo
Onozawa et al[33]	2008	Japan	13	Allo
Meerveld-Eggink et al[41]	2009	Netherlands	26	Allo
Small et al[30]	2009	United States	28	Auto
Cordonnier et al[29]	2009	France	158	Allo
Yalçin et al[14]	2010	Turkey	61	Allo+auto
Issa et al[13]	2011	United States	82	Allo
De Lavallade et al[19]	2011	United Kingdom	26	Allo
Mohty et al[18]	2011	Switzerland	57	Allo
Gueller et al[23]	2011	Germany	17	Allo+auto
Engelhard et al[24]	2011	Israel	78	Allo+auto
Roll et al[17]	2012	Germany	38	Allo
Mariotti et al[15]	2012	Italy	15	Allo
Villa et al[25]	2012	Canada	40	Auto
Karras et al[20]	2013	United States	65	Allo
Dhédin et al[16]	2014	France	59	Allo
Takahata et al[34]	2014	Japan	21	Allo
Shah et al[42]	2015	United States	63	Allo
Cordonnier et al[27]	2015	France	162	Allo
Natori et al[21]	2016	Canada	73	Allo
Halasa et al[22]	2016	United States	44	Allo
Okinaka et al[26]	2017	Japan	30	Allo
Palazzo et al[46]	2018	United States	122	Auto
Cheng et al[32]	2018	United States	67	Allo+auto
Langedijk et al[28]	2019	Netherlands	103	Allo
Aoki et al[36]	2019	Japan	29	Allo
Conrad et al[43]	2020	France	91	Allo
Winkler et al[44]	2020	Germany	27	Allo
Camargo et al[38]	2020	United States	30	Allo+auto
Stadtmauer et al[39]	2021	United States	922	Auto
Kawamura et al[37]	2021	Japan	25	Allo

N = number of vaccinated post-HSCT patients in study population; auto = autologous HSCT recipients; allo = allogeneic HSCT recipients.

Table S3A. Cochrane Risk of Bias tool for Randomized Controlled Trials*.

Study	Randomization process	Deviation from intended intervention	Missing outcome data	Measurement of outcome	Selection of reported result
Cordonnier et al[29]	🟢	🟢	🟢	🟢	🟢
Villa et al[25]	🟢	🟢	🟢	🟢	🟢
Karras et al[20]	🟢	🟢	🟢	🟢	🟢
Natori et al[21]	🟢	🟢	🟢	🟢	🟢
Halasa et al[22]	🟢	🟢	🟡	🟢	🟢
Stadtmauer et al[39]	🟢	🟢	🟢	🟢	🟢

🟢 = low risk; 🟡 = moderate risk; 🔴 = serious risk; *The legend is displayed in supplement table 3C.

Table S3B. Robins-I Risk of Bias tool for Non-randomized Studies of Interventions*.

Study	Confounding	Selection	Intervention classification	Deviation from intended intervention	Missing data	Measurement of outcome	Selection of reported result
Van der Velden et al[31]	🟢	🟡	🟢	🟡	🟢	🟢	🟢
Jaffe et al[35]	🟢	🟢	🟢	🟢	🟡	🟢	🟢
Van der Velden et al[45]	🟢	🟡	🟢	🟡	🟡	🟢	🟢
Avetisyan et al[12]	🟢	🔴	🟢	🟢	🟡	🟢	🟢
Pao et al[40]	🟢	🟡	🟢	🟢	🟢	🟢	🟢
Onozawa et al[33]	🟢	🟡	🟢	🟢	🟢	🟢	🟢
Meerveld-Eggink et al[41]	🟢	🟡	🟢	🟢	🟡	🟢	🟢
Small et al[30]	🟢	🟡	🟢	🟡	🟡	🟢	🟢
Yalçin et al[14]	🟢	🟡	🟢	🟢	🟡	🟢	🟢
Issa et al[13]	🔴	🟡	🟢	🟢	🟢	🟢	🟢
De Lavallade et al[19]	🟢	🟢	🟢	🟢	🟡	🟢	🟢
Mohty et al[18]	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Gueller et al[23]	🟢	🟡	🟢	🟢	🔴	🟢	🟢
Engelhard et al[24]	🟢	🟡	🟢	🟢	🟡	🟢	🟢
Roll et al[17]	🟢	🟡	🟢	🟡	🟡	🟢	🟢
Mariotti et al[15]	🟢	🟢	🟢	🟢	🟡	🟢	🟢
Dhédin et al[16]	🟢	🟡	🟢	🟢	🟢	🟢	🟢
Takahata et al[34]	🟡	🟡	🟢	🟢	🟢	🟢	🟢
Shah et al[42]	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Cordonnier et al[27]	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Okinaka et al[26]	🟢	🟡	🟢	🟢	🟢	🟢	🟢
Palazzo et al[46]	🟢	🟡	🟢	🟢	🟢	🟢	🟢
Cheng et al[32]	🟢	🟡	🟢	🟢	🟢	🟢	🟢
Langedijk et al[28]	🔴	🟢	🟢	🟢	🟢	🟢	🟢
Aoki et al[36]	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Conrad et al[43]	🟢	🟢	🟢	🟡	🟢	🟢	🟢
Winkler et al[44]	🟢	🟡	🟢	🟢	🟡	🟢	🟢
Kawamura et al[37]	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Camargo et al[38]	🟢	🟢	🟢	🟢	🔴	🟢	🟢

● = low risk; ● = moderate risk; ● = serious risk; *The legend is displayed in supplement table 3D.

Table S3C. Legend for supplement table 3A (Cochrane Risk of Bias tool for Randomized Controlled Trials).

Randomization process	● allocation random and concealment guaranteed ● allocation concealment not precisely described or not adequately guaranteed ● allocation not random or no concealment guaranteed
Deviation from intended intervention	● complete population vaccinated according to pre-set schedule or slight deviation from set schedule reported adequately without disturbance of the balance between groups ● no accurate data on actual moment of vaccination but considered not to be concerning for the outcomes and without disturbance of the balance between groups ● deviation from pre-set schedule that is concerning for the outcomes or with disturbance of the balance between groups
Missing outcome data	● no missing data or missing data with properly reported reasoning ● missing data without reported reasoning but not concerning for outcomes and balance ● missing data that is concerning to influence the outcomes or to disturb balance
Measurement of outcome	● methods clearly described and considered adequate and were equal between groups ● methods not clearly described but considered adequate and were equal between groups ● methods considered inadequate or were inequal between groups
Selection of reported result	● complete and extensive report of all results according to pre-specified analysis plan ● reporting of results complete but not (properly) extensive ● incomplete reporting of results or not in accordance with pre-specified analysis plan

Table S3D. Legend for supplement table 3B (Robins-I Risk of Bias tool for Non-randomized Studies of Interventions).

Confounding	● pre-vaccination titers available and taken into analysis ● no pre-vaccination titers available but data available on previous vaccination or immune status ● no pre-vaccination titers and no data on previous vaccination or immune status available
Selection	● study population representative for target population ● possible selection of patient groups but not-concerning ● selection of patient groups that is concerning for the outcomes
Intervention classification	● clearly pre-set schedule for vaccinating study population ● schedule for vaccinating study population not clearly set ● no pre-set schedule for vaccinating study population
Deviation from intended intervention	● whole study population vaccinated according to the pre-set schedule or deviation from set schedule with adequate reporting ● no accurate data on actual moment of vaccination but considered not to be concerning for the outcomes ● deviation that is possibly concerning for the outcomes
Missing data	● no missing data or missing data with properly reported reasoning ● missing data without reported reasoning but not concerning for outcomes ● missing data that is concerning to influence the outcomes

Measurement of outcome	🟢 methods used for outcome clearly described and considered adequate 🟡 methods used for outcome not clearly described but considered adequate 🔴 methods used for outcome considered inadequate
Selection of reported results	🟢 complete and extensive report of all results according to pre-specified analysis plan 🟡 reporting of results complete but not (properly) extensive 🔴 incomplete reporting of results or not in accordance with pre-specified analysis plan

Table S4. Used definitions for response vaccine response per included study.

Vaccine	Definition for response		Studies using this definition
	Seroprotection	Seroconversion	
Influenza	Absolute titer >1:40	Pre-vaccination titer ≤ 1:10 and post-vaccination ≥ 1:40 or pre-vaccination > 1:10 and post-vaccination ≥4-fold rise in titer	Villa et al,[25] Gueller et al,[23] Engelhard et al,[24] Roll et al,[17] Mariotti et al,[15] Dhédin et al,[16] Mohty et al[18]
	Absolute titer ≥1:40	Post-vaccination ≥4-fold rise in titer	Karras et al,[20] Natori et al,[21] Halasa et al,[22] Yalçin et al[14]
	Absolute titer ≥1:40		Avetisyan et al,[12] Issa et al[13]
	Absolute titer ≥1:32	Pre-vaccination titer <1:8 and post-vaccination ≥1:32 or pre-vaccination ≥1:8 and post-vaccination ≥4-fold rise in titer	De Lavallade et al[19]
Pneumococcus		≥2-fold rise in titer and absolute titer ≥0.35 ug/ml for ≥2/3 tested serotypes	Van der Velden et al[45]
	Absolute titer ≥0.35 µg/ml	≥4-fold rise in titer	Meerveld-Eggink et al,[41] Winkler et al[44]
	Absolute titer >0.15ug/ml for all PCV7 serotypes		Cordonnier et al[29]
	Absolute titer ≥0.35 µg/ml		Cordonnier et al,[27] Langedijk et al[28]
		≥3-fold rise in titer for serotypes 14,1 9f and 23f	Pao et al,[40] Shah et al[42]
		≥2-fold rise in titer	Okinaka et al[26]
		≥2-fold rise in titer for ≥70% of serotypes	Palazzo et al[46]
Diphtheria		≥4-fold rise in titer	Small et al[30]
	Absolute titer ≥0.01 IU/ml	≥4-fold rise in titer	Palazzo et al[46]
		≥3-fold rise in titer	Shah et al[42]
	Absolute titer ≥0.1 IU/ml	≥4-fold rise in titer	Winkler et al[44]
	Absolute titer ≥0.1 IU/ml		Conrad et al[43]
Tetanus	Absolute titer ≥0.1 IU/ml	≥4-fold rise in titer	Meerveld-Eggink et al,[41] Winkler et al[44]
	Absolute titer ≥0.15 IU/ml	≥4-fold rise in titer	Palazzo et al[46]
		≥4-fold rise in titer	Small et al[30]
		≥3-fold rise in titer	Shah et al[40]
	Absolute titer ≥0.1 IU/ml		Conrad et al[43]
	Absolute titer 0.01 IU/ml		Van der Velden et al[45]
Pertussis		≥2-fold rise in titer	Small et al,[30] Shah et al[42]
	Absolute titer ≥ 24 IU/ml	≥4-fold rise in titer	Winkler et al[44]
	Absolute titer >5 IU/ml	Titer increase to >5 IU/ml	Palazzo et al[46]
Poliomyelitis	Absolute titer ≥ 10 U/ml	≥4-fold rise in titer and ≥ 100% increase between pre-vaccination and post-vaccination	Winkler et al[44]
		≥3-fold rise in titer	Shah et al[42]
***Haemophilus influenzae* type b**	Absolute titer ≥1.0 ug/ml		Conrad et al,[43] Van der Velden et al[31]
	Absolute titer ≥1.0 ug/ml	≥4-fold rise in titer and ≥ 100% increase between pre-vaccination and post-vaccination	Winkler et al[44]

		≥4-fold rise in titer and post-vaccination levels ≥6.16 ug/ml	Van der Velden et al[45]
	Absolute titer ≥1.0 ug/ml	Conversion from non-protective (<0.15 ug/ml) to protective (≥1.0 ug/ml) or ≥4-fold rise in titer if in indeterminate range	Palazzo et al[46]
		≥3-fold rise in titer	Shah et al[42]
		Conversion to >1 ug/ml or >3-fold increase titer	Pao et al[40]
		≥4-fold rise in titer	Meerveld-Eggink et al[41]
Meningococcus	**Serum Bacterial Activity (SBA) titers ≥1:8**		Cheng et al[32]
Hepatitis B	Seroprotection anti-Hbs >10 mIU/ml		Onozawa et al,[33] Jaffe et al,[35] Conrad et al,[41] Takahata et al[34]
	Seroprotection anti-Hbs >10 mIU/ml	Conversion from non-protective to protective	Palazzo et al[44]
Measles	Absolute titer ≥8.0 IU/ml	Conversion from non-protective to protective	Aoki et al[36]
	Absolute titer ≥4.0 IU/ml		Kawamura et al[37]
Mumps	Absolute titer ≥6.0 IU/ml	Conversion from non-protective to protective	Aoki et al[36]
	Absolute titer ≥4.0 IU/ml		Kawamura et al[37]
Rubella	Absolute titer ≥8.0 IU/ml	Conversion from non-protective to protective	Aoki et al[36]
	Absolute titer ≥4.0 IU/ml		Kawamura et al[37]
Varicella zoster virus		Conversion from non-protective to protective Or ≥4-fold rise in titer	Camargo et al,[38] Stadtmauer et al[39]

Table S5. Suggestions for evaluation of vaccine response in clinical practice. .

Vaccine	Cut-off value for response
Pneumococcus	≥0.35 ug/ml
Meningococcus	≥1.0 ug/ml
Hepatitis B	>10 mIU/ml
Measles	≥0.15 IU/ml
Tetanus	≥0.1 IU/ml