

Additional file 1: Supplementary tables and figures

Table S1. Search strategies and results

Database	Search strategies	Restriction to recent years (2010-2015)
Wanfang	((主题:(“肺炎”))* ((主题:(“前瞻”+“监测”+“随访”+“巢式病例对照”+“套叠式病例对照研究”+“队列”)) * (主题:(“发病”+“发生”))))	2915
CNKI	(主题=“肺炎”) and (主题=“前瞻”+“监测”+“随访”+“巢式病例对照”+“套叠式病例对照研究”+“队列”) and (主题=“发病”+“发生”)	2437
CBM	(“前瞻”+“监测”+“随访”+“巢式病例对照”+“套叠式病例对照研究”+“队列”) and (“发生”+“发病”) and (“肺炎”) [常用字段:智能]	2800
Medline OVID	((surveillance.mp. or exp surveillance/) or (prospective.mp. or exp prospective/) or (follow-up.mp. or exp follow-up/) or (cohort.mp. or exp cohort/) or (nested case-control.mp. or exp nested case-control/)) and ((Pneumonia.mp. or exp Pneumonia/ or (pneumon*.tw.)) and ((China.mp. or exp China/ or (Chinese.mp. or Chinese.tw.)) and (incidence.mp. or exp incidence/)	39
Embase OVID	((surveillance.mp. or exp surveillance/) or (prospective.mp. or exp prospective/) or (follow-up.mp. or exp follow-up/) or (cohort.mp. or exp cohort/) or (nested case-control.mp. or exp nested case-control/)) and ((Pneumonia.mp. or exp Pneumonia/ or (pneumon*.tw.)) and ((China.mp. or exp China/ or (Chinese.mp. or exp Chinese/ or exp Han Chinese/)) and (incidence.mp. or exp incidence/)	84
Total		8275

Table S2. List of all the included studies

No.	ID	Reference
1	Cai 2010	Cai XD, Cao Y, Chen C, Yang Y, Wang CQ, Zhang L, et al. [Investigation of nosocomial infection in the neonatal intensive care unit]. Chinese Journal of Contemporary Pediatrics. 2010; 12(2):81-84.
2	Cai 2015	Cai JP. [Hospital Infection Status and Prevention Measures in an ICU]. Chinese Rural Health Service Administration. 2015; 35(12):1523-1525.
3	Chen 2010a	Chen HP. [Prevalence study and influence factors of nosocomial infection in ICU of the hospital in Jincheng anthracite mining group]. Unpublished Master Dissertation. Shanxi Medical School, 2010.
4	Chen 2010b	Chen T, Liu Y, He Y, Qin GY, Chen M. [The impact of invasive procedure on hospital infections in patients in ICU]. Chinese General Practitioner. 2010; 13(32):3686-3687, 3691.
5	Chen 2010c	Chen XW, Luo XL, Xu SJ, Huang XY, Zhu YR. [Influencing Factors for Ventilator-associated Pneumonia in Pediatric ICU: A Logistic Regression Study and Distribution of Pathogens]. Chinese Journal of Nosocomiology. 2010; 20(21):3270-3272.
6	Chen 2011a	Chen GL, Wu HL, He YQ, Yu JW. [Distribution of ventilator-associated pneumonia pathogens in intensive care unit and drug resistance surveillance]. Chinese Journal of Nosocomiology. 2011; 21(6):1244-1246.
7	Chen 2011b	Chen XM. [Surveillance of pathogens from patients with hospital infection and analysis of drug resistance and hospital infection prevention in intensive care unit]. Unpublished Master Dissertation. Guangzhou Medical School, 2011.
8	Chen 2012	Chen FY, Wang ZY, Wang Y, Xiao C, Qiu SX, Wang SG. [Application of hospital infection monitor system in ventilator-associated pneumonia in ICU]. China Medical Herald. 2012; 9(31):50-51, 54.
9	Chen 2013a	Chen CY. [Objective monitoring and evaluation of intervention for pneumonia after anesthesia]. Modern Journal of Integrated Traditional Chinese And Western Medicine. 2013; 22(10):1085-1087.
10	Chen 2013b	Chen XW, Zhang XK, Luo XL. [Results of targeted surveillance of nosocomial infections from 2009 to 2011 and the changing trends]. Chinese Journal of Nosocomiology. 2013; 23(7):1507-1509.
11	Chen 2013c	Chen YH, Luo JQ. [Analysis of neonatal intensive care unit hospital infection targeted monitoring result]. Medical Innovation of China. 2013(12):43-44.
12	Chen 2013d	Chen WZ, Zhao Z, Huang YL, Lan ZX, Liang JW, Liang LC, et al. [Analysis of the pathogenic bacteria of ventilator associated pneumonia and control countermeasures in comprehensive ICU]. Journal of Tropical Medicine. 2013; 13(7):809-812.
13	Chen 2014	Chen LL, Gui XL, Huang SF, Pan XP. [Distribution and drug resistance monitor of ventilator-associated pneumonia pathogens in ICU]. Chinese Journal of Disinfection. 2014; 31(1):33-34, 37.
14	Chen 2015a	Chen DW, Zhuang GH. [Analysis of risk factors and prevention strategies of targeted monitoring in ICU]. Gansu Medical Journal. 2015; 34(2):128-129.
15	Chen 2015b	Chen SM. [Effect of targeted monitoring of ventilator-associated pneumonia in ICU in Huai'an Second People's Hospital]. Chongqing Medicine. 2015; 44(2):274-275.
16	Cheng 2013	Cheng KP, Kong QF, Zhang XJ, Li JW, Wang CX. [The targeted surveillance and analysis of catheter associated infections in ICU]. Chongqing Medicine. 2013; 42(7):793-794.
17	Cui 2012	Cui RX, Shen SM, Jiang LH, Cui PF. [Targeted monitoring of nosocomial infections in ICU]. Chinese Journal of Nosocomiology. 2012; 22(10):2030-2032.
18	Deng 2015	Deng NM, Wang H, Wang J, Huang M. [Observation on prospective monitoring and cluster intervention of nosocomial infection in intensive care unit of hospital]. Chinese Journal of Disinfection. 2015; 32(10):994-996.
19	Ding 2011	Ding XY. [Results and analysis of investigations about the nosocomial infections among neonates in ICUs of Xining area]. Journal of High Altitude Medicine. 2011;

21(4):57-58.

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Table S3. General information of all the included studies

Study ID	Risk of bias	Province	Start	Finishing	Study design	Clinical department ^a	Hospital level	Diagnostic criteria ^b	VAP patients per 1000 ventilator-days	VAP episodes per 1000 ventilator-days	Cumulative incidence
Cai 2010	low	Shanghai	Feb 2006	Jan 2007	Surveillance	NICU	Tertiary	Others		√	
Cai 2015	moderate	Zhejiang	Mar 2013	Jul 2014	Surveillance	ICU	Non-tertiary	Unclear	√		
Chen 2010a	low	Shanxi	Sep 2008	Dec 2009	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√	
Chen 2010b	low	Guizhou	Apr 2009	Mar 2010	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001			√
Chen 2010c	low	Jiangxi	Jan 2008	Dec 2008	Surveillance	PICU	Tertiary	Criteria by Chinese Thoracic Society in 1999			√
Chen 2011a	moderate	Jiangxi	Jan 2007	Jan 2008	Surveillance	ICU	Tertiary	Others			√
Chen 2011b	moderate	Guangdong	Jan 2009	Dec 2010	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√	
Chen 2012	low	Hubei	Jan 2010	Oct 2011	Surveillance	ICU	Non-tertiary	Criteria by the Chinese Ministry of Health in 2001	√		√
Chen 2013a	low	Hebei	May 2010	May 2011	Surveillance	ICU	Non-tertiary	Criteria by Chinese Thoracic Society in 1999			√
Chen 2013b	low	Jiangxi	Jul 2009	Jun 2011	Surveillance	Unclear	Tertiary and Non-tertiary	Criteria by the Chinese Ministry of Health in 2001	√		√
Chen 2013c	moderate	Guangxi	Mar 2011	Feb 2012	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√	
Chen 2013d	low	Guangdong	Jan 2009	Dec 2011	Surveillance	General ICU	Non-tertiary	Others			√
Chen 2014	low	Jiangxi	Jan 2010	Dec 2011	Surveillance	ICU	Tertiary	Others			√
Chen 2015a	low	Shaanxi	Sep 2013	Nov 2013	Surveillance	ICU	unclear	Criteria by the Chinese Ministry of Health in 2001		√	
Chen 2015b	low	Jiangsu	Jul 2012	Jun 2013	Surveillance	General ICU	Tertiary and Non-tertiary	Criteria by Chinese Thoracic Society in 1999	√	√	
Cheng 2013	low	Jiangsu	Jan 2011	Dec 2011	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		
Cui 2012	low	Jiangsu	Jan 2010	Dec 2010	Surveillance	ICU	Tertiary	Criteria by the Chinese	√		

								Ministry of Health in 2001		
Deng 2015	moderate	Shandong	Jan 2011	Dec 2013	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Ding 2011	low	Qinghai	Jan 2009	Dec 2010	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Feng 2013	moderate	Zhejiang	Jan 2008	Dec 2012	Surveillance	RICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Fu 2010	low	Shanghai	Jan 2006	Dec 2009	Surveillance	SICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Fu 2011	low	Shanghai	Jan 2006	Dec 2009	Surveillance	Medical ICU, SICU, Neurosurgery ICU, Cardiac surgery ICU, and Transplantation ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Gao 2011	low	Shanxi	Jul 2008	Jun 2009	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Gao 2014	low	Hubei	Jan 2012	Dec 2012	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	√
Gao 2015a	moderate	Heilongjiang	Oct 2014	Mar 2015	Prospective cohort study	RICU	Tertiary	Others	√	√
Gao 2015b	low	Unclear	Oct 2013	Sep 2014	Surveillance	General ICU	Tertiary and Non-tertiary	Criteria by Chinese Thoracic Society in 1999	√	
He 2015	high	Zhejiang	Jan 2012	Jan 2014	Prospective cohort study	ICU	Non-tertiary	Unclear	√	√
Hou 2015	low	Chongqing	Jan 2013	Dec 2013	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Hu 2012	low	Hubei	Jul 2009	Jun 2010	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Huang 2011a	moderate	Sichuan	Jan 2009	Dec 2010	Surveillance	ICU	Tertiary	Unclear		√
Huang 2011b	moderate	Sichuan	Jan 2010	Dec 2010	Surveillance	ICU	Non-tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Huang 2012	moderate	Fujian	Jul 2008	Jun 2011	Prospective cohort study	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	√
Huang 2013	low	Guangxi	Jan 2011	Jun 2012	Surveillance	PICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	√
Huang 2014	low	Guangxi	Jan 2010	Dec 2013	Surveillance	ICU	Tertiary	Others	√	

Huang 2015a	high	Jiangsu	Jan 2012	Dec 2012	Surveillance	General ICU	Tertiary	Unclear	√		
Huang 2015b	high	Henan	Jan 2010	Dec 2013	Surveillance	ICU	Tertiary	Unclear	√		√
Jia 2011	low	Beijing	Jan 2007	Dec 2009	Surveillance	SICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√	√
Jia 2015	moderate	Xinjiang	Jan 2013	Dec 2013	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		
Jiang 2012a	low	Jiangsu	May 2010	Oct 2011	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√	
Jiang 2012b	moderate	Jiangsu	Jan 2011	Dec 2011	Surveillance	ICU	Tertiary and Non-tertiary	Criteria by the Chinese Ministry of Health in 2001		√	
Jiang 2015	low	Jiangsu	Jan 2010	Dec 2012	Surveillance	General ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√	√	√
Kong 2012	moderate	Jiangsu	Jan 2010	Dec 2010	Surveillance	ICU	Non-tertiary	Unclear	√		
Lei 2010	moderate	Jiangxi	Jan 2009	Dec 2009	Surveillance	Neonatal department	Tertiary	Criteria by Chinese Thoracic Society in 1999			√
Li 2011a	moderate	Sichuan	Jan 2009	Dec 2009	Surveillance	NICU	Tertiary	Unclear	√		
Li 2011b	low	Heilongjiang	Jul 2010	Dec 2010	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	√	√
Li 2012	moderate	Sichuan	Jan 2009	Dec 2009	Surveillance	General ICU	Non-tertiary	Unclear	√	√	√
Li 2013a	low	Sichuan	Jan 2010	Jun 2012	Surveillance	General ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√		√
Li 2013b	low	Hubei	Jan 2011	Dec 2011	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√	
Li 2014a	low	Guangxi	Jan 2012	Dec 2013	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√	
Li 2014b	low	Guangxi	May 2012	May 2013	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√	
Li 2014c	low	Anhui	Jan 2013	Dec 2013	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		√
Li 2015a	low	Sichuan	Jan 2014	Dec 2014	Surveillance	RICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		
Li 2015b	low	Beijing, Shanghai, Chongqing, Zhejiang, Jiangsu,	Oct 2013	Mar 2014	Prospective cohort study	ICU	Tertiary and Non-tertiary	Others		√	

Study ID	Quality Score	Province	Start Date	End Date	Study Design	ICU Type	Hospital Level	Criteria	Checkmark 1	Checkmark 2
		Henan, Hunan, Guangdong, Shandong, Shanxi, Guizhou, Sichuan, and Liaoning								
Li 2015c	moderate	Jiangsu	Dec 2012	Sep 2014	Prospective cohort study	PICU	Tertiary	Criteria by Chinese Critical Care Medicine Society in 2013	√	√
Li 2015d	moderate	Anhui	Jun 2011	Dec 2012	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Liao 2013	low	Guangxi	Jan 2010	Aug 2012	Surveillance	Neonatal department	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Lin 2011	moderate	Henan	Nov 2008	Oct 2009	Surveillance	General ICU	Tertiary	Unclear	√	
Lin 2014	moderate	Henan	Jan 2011	Dec 2011	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Lin 2015	high	Guangxi	Jan 2013	Dec 2014	Prospective cohort study	ICU	Tertiary	Unclear	√	√
Liu 2010	low	Inner Mongolia	Jan 2009	Dec 2009	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Liu 2011	moderate	Fujian	Apr 2009	Mar 2010	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√	√
Liu 2013a	low	Jiangsu	Jan 2011	Dec 2011	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Liu 2013b	low	Shandong	Jan 2012	Dec 2012	Surveillance	General ICU	Non-tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Liu 2014	low	Hebei	Jan 2012	Dec 2012	Surveillance	General ICU, Neurology ICU, and CCU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	√
Liu 2015a	low	Anhui	Jan 2013	Dec 2013	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	√
Liu 2015b	low	Inner Mongolia	Jan 2014	Dec 2014	Surveillance	Unclear	Unclear	Criteria by the Chinese Ministry of Health in 2001	√	
Liu 2015c	low	Shanxi	Jul 2013	Dec 2013	Surveillance	ICU	Tertiary	Criteria by the Chinese	√	

								Ministry of Health in 2001	
Luo 2014	moderate	Fujian	Jan 2012	Dec 2012	Surveillance	Neurosurgery ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Ma 2012a	low	Shanxi	Feb 2009	Nov 2010	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Ma 2012b	high	Jiangsu	Jan 2011	Jun 2012	Surveillance	ICU	Tertiary	Unclear	√
Mai 2013	low	Guangdong	Jan 2012	Sep 2012	Surveillance	Neonatal department	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Mao 2010	low	Sichuan	Jul 2008	Jun 2009	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√
						Medical ICU, SICU, Neurosurgery ICU, Cardiac surgery ICU, CCU, PICU, General ICU, Trauma ICU, and Transplantation ICU			
Mao 2012	low	Shanghai	Jan 2009	Dec 2010	Surveillance	CCU, PICU, General ICU, Trauma ICU, and Transplantation ICU	Tertiary and Non-tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Mi 2011	low	Shanghai	Jan 2005	Dec 2009	Surveillance	SICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Ming 2012	low	Sichuan	Jan 2011	Jun 2011	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Pan 2013a	low	Guangdong	Jan 2010	Dec 2012	Surveillance	NICU	Non-tertiary	Criteria by Chinese Thoracic Society in 1999	√
Pan 2013b	low	Jiangsu	Jan 2011	Dec 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Peng 2013	moderate	Sichuan	Feb 2010	Sep 2012	Surveillance	ICU	Tertiary	Others	√
Pu 2011	moderate	Sichuan	Sep 2010	Feb 2011	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Qi 2010a	low	Zhejiang	Mar 2008	Sep 2009	Surveillance	EICU	Non-tertiary	Criteria by Chinese Thoracic Society in 1999	√
Qi 2010b	moderate	Hebei	Jun 2008	Oct 2009	Prospective cohort study	RICU	Tertiary	Others	√
Qi 2013	low	Anhui	Jan 2011	Dec 2011	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Qian 2015	moderate	Anhui	Jan 2011	Dec 2011	Surveillance	General ICU	Tertiary	Unclear	√
Qu 2011	low	Henan	Dec 2009	Nov 2010	Surveillance	Neurosurgery	Tertiary	Criteria by the Chinese	√

Author	Quality	Location	Start	End	Study Design	ICU Type	Level	Criteria	Checkmark
Qu 2015	moderate	Beijing	Sep 2010	Aug 2012	Prospective cohort study	PICU	Tertiary	emergency room Ministry of Health in 2001 Criteria by Chinese Critical Care Medicine Society in 2013	√
Ren 2012	low	Beijing	Feb 2010	Sep 2011	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Ren 2015	low	Beijing, Shandong, Shanxi, Chongqing, Zhejiang, Jiangsu, Henan, Hunan, and Guangdong	Oct 2013	Sep 2014	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Shen 2010	low	Jiangsu	Nov 2008	Apr 2009	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Sheng 2015	low	Anhui	Jan 2013	Dec 2013	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Shu 2015a	moderate	Anhui	Apr 2012	Apr 2013	Prospective cohort study	Unclear	Tertiary	Others	√
Shu 2015b	low	Anhui	Oct 2012	Sep 2013	Prospective cohort study	NICU	Tertiary	Others	√
Situ 2015	moderate	Guangdong	Jan 2011	Dec 2013	Surveillance	NICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√
Song 2013	low	Jiangsu	Sep 2010	Sep 2011	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Song 2015	low	Hebei	Jan 2012	Dec 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Sun 2015	low	Sichuan	Apr 2013	Jul 2013	Surveillance	ICU	Tertiary	Others	√
Tang 2012a	moderate	Sichuan	May 2011	Oct 2011	Surveillance	ICU	Non-tertiary	Unclear	√
Tang 2012b	low	Jiangxi	Jun 2006	May 2007	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Tang 2013	low	Jiangsu	Jan 2010	Dec 2011	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√
Tang 2015	moderate	Jiangsu	May 2014	Sep 2014	Surveillance	ICU	Non-tertiary	Unclear	√
Wang 2010a	high	Beijing	Oct 2009	Dec 2009	Prospective	Unclear	Tertiary	Unclear	√

Author	Quality	Location	Start	End	Study Design	ICU Type	Level	Criteria	Checkmark	Checkmark
					cohort study					
Wang 2010b	moderate	Guangdong	Dec 2006	Oct 2007	Surveillance	General ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Wang 2010c	moderate	Shanghai	Jul 2006	Jun 2009	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Wang 2011a	moderate	Xinjiang	Jan 2009	Dec 2009	Surveillance	SICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Wang 2011b	moderate	Shaanxi	Sep 2010	Dec 2010	Surveillance	Emergency room and ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√	√
Wang 2011c	moderate	Hebei	May 2010	Mar 2011	Prospective cohort study	RICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Wang 2012	moderate	Henan	Jan 2009	Dec 2010	Surveillance	Cardiac surgical ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Wang 2013a	low	Jiangsu	Jan 2012	Dec 2012	Surveillance	NICU	Non-tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Wang 2013b	moderate	Unclear	Jan 2011	Dec 2011	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Wang 2013c	moderate	Shandong	Oct 2009	Jan 2013	Surveillance	ICU	Non-tertiary	Criteria by Chinese Thoracic Society in 1999		√
Wang 2013d	moderate	Henan	Jan 2012	Dec 2012	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Wang 2014a	moderate	Henan	Jul 2011	Jun 2013	Surveillance	General ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√	√
Wang 2014b	moderate	Jiangsu	Jan 2012	Dec 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Wang 2014c	low	Zhejiang	Jan 2011	Dec 2012	Surveillance	Neonatal department	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	√
Wang 2015a	moderate	Zhejiang	Jan 2012	Sep 2013	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Wang 2015b	low	Zhejiang	Feb 2012	Feb 2013	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Wang 2015c	low	Hubei	Mar 2012	Mar 2013	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Wang 2015d	low	Xinjiang	Jan 2011	Dec 2013	Surveillance	NICU	Tertiary	Others	√	√
Wei 2010	moderate	Guangdong	Jun 2008	Nov 2008	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√

Wei 2012	moderate	Xinjiang	Mar 2011	Aug 2011	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Wei 2013	moderate	Xinjiang	Mar 2012	Aug 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Wen 2013	moderate	Anhui	Jun 2010	Jun 2011	Prospective cohort study	ICU	Non-tertiary	Criteria by Chinese Thoracic Society in 1999		√
Wu 2012	low	Guangdong	Jan 2010	Sep 2010	Surveillance	NICU	Non-tertiary	Criteria by the Chinese Ministry of Health in 2001	√	√
Wu 2013	low	Zhejiang	Jan 2009	Dec 2012	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√	
Wu 2015	low	Hebei	Sep 2013	Aug 2014	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Xiang 2014	moderate	Sichuan	Jan 2012	Dec 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Xie 2011	high	Jiangsu	Nov 2009	Feb 2010	Surveillance	ICU	Unclear	Unclear		√
Xie 2014	moderate	Hubei	Jan 2007	Dec 2010	Surveillance	ICU	Tertiary	Unclear	√	√
Xing 2012	low	Anhui	Apr 2010	Sep 2010	Surveillance	ICU	Non-tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Xing 2013	low	Anhui	Feb 2012	Jul 2012	Surveillance	NICU	Non-tertiary	Criteria by Chinese Thoracic Society in 1999	√	√
Xu 2010a	low	Hebei	Jan 2006	Dec 2008	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Xu 2010b	low	Jiangxi	Feb 2009	Jan 2010	Surveillance	Neonatal department	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Xu 2014a	moderate	Xinjiang	Jan 2012	Dec 2012	Surveillance	ICU	Non-tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Xu 2014b	moderate	Hubei	Jan 2011	Dec 2012	Surveillance	PICU	Tertiary	Others		√
Xue 2014	moderate	Hubei	Oct 2010	Sep 2012	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Xue 2015	moderate	Shanxi	Jan 2009	Dec 2012	Prospective cohort study	ICU	Non-tertiary	Criteria by Chinese Thoracic Society in 1999		√
Yan 2014	moderate	Unclear	Jan 2011	Dec 2012	Surveillance	ICU	Unclear	Criteria by the Chinese Ministry of Health in 2001		√
Yang 2012	low	Zhejiang	Jan 2010	Dec 2010	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√	√
Yang 2013	low	Jiangsu	Jan 2011	Dec 2011	Surveillance	General ICU	Non-tertiary	Criteria by the Chinese	√	

								Ministry of Health in 2001		
Yang 2014a	moderate	Beijing	Jun 2010	Dec 2010	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Yang 2014b	high	Gansu	Jan 2013	Dec 2013	Prospective cohort study	ICU	Tertiary	Unclear		√
Yang 2014c	moderate	Beijing	Jun 2007	May 2010	Prospective cohort study	ICU	Tertiary	Others	√	√
Yang 2014d	low	Jiangxi	Jan 2012	Aug 2013	Surveillance	General ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Yang 2015a	moderate	Hebei	Jan 2012	Dec 2013	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Yang 2015b	moderate	Jiangsu	Jun 2013	May 2014	Prospective cohort study	ICU	Tertiary	Criteria by Chinese Critical Care Medicine Society in 2013	√	√
Yao 2015	moderate	Hebei	Jan 2014	Dec 2014	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Ye 2014	moderate	Zhejiang	Jan 2010	Sep 2013	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√	√
Ying 2011	low	Shandong	Jan 2008	Dec 2010	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Ying 2013	moderate	Shandong	Jan 2008	Dec 2008	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
You 2012	moderate	Jiangxi	Sep 2009	Mar 2011	Surveillance	ICU	Non-tertiary	Criteria by Chinese Thoracic Society in 1999		√
Yu 2011a	low	Henan	May 2008	Jan 2010	Surveillance	RICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Yu 2011b	low	Zhejiang	Jan 2010	Dec 2010	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Yu 2012a	low	Shanghai	Jan 2008	Dec 2011	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Yu 2012b	moderate	Anhui	Jan 2009	Dec 2009	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Yu 2014	high	Jiangxi	Apr 2010	Apr 2012	Surveillance	ICU	Non-tertiary	Unclear	√	√
Yu 2015a	moderate	Jiangxi	Aug 2012	Jul 2013	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	√
Yu 2015b	low	Shanghai	Jun 2009	Jun 2012	Prospective	ICU	Tertiary	Criteria by Chinese	√	√

Author (Year)	Severity	Province	Start	End	Study Design	ICU Type	Level	Criteria	✓	✓	✓
					cohort study			Thoracic Society in 1999			
Yu 2015c	moderate	Jiangsu	Jan 2011	Dec 2014	Surveillance	General ICU and SICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√	√	√
Yuan 2011	low	Beijing	Jan 2008	Dec 2010	Surveillance	SICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		
Yue 2015	moderate	Shandong	Jan 2010	Aug 2012	Prospective cohort study	ICU	Tertiary and Non-tertiary	Unclear	√		
Zeng 2014	low	Sichuan	Apr 2013	Jul 2013	Surveillance	ICU	Tertiary	Others			√
Zhang 2010a	low	Shanghai	Sep 2004	Dec 2009	Surveillance	SICU, Cardiac surgery ICU, CCU, Medical ICU, EICU and RICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		√
Zhang 2010b	high	Guangxi	Jan 2009	Dec 2009	Surveillance	Neonatal department	Tertiary	Unclear			√
Zhang 2011a	low	Zhejiang	Feb 2009	Jan 2010	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√	
Zhang 2011b	moderate	Shanxi	Nov 2008	Nov 2009	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		√
Zhang 2011c	low	Chongqing	Jan 2010	Dec 2010	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		
Zhang 2011d	low	Chongqing	Jan 2010	Dec 2010	Surveillance	RICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		
Zhang 2011e	low	Guangxi	Jan 2009	Dec 2010	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√	
Zhang 2011f	moderate	Fujian	Apr 2008	Dec 2008	Surveillance	SICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√		
Zhang 2012a	moderate	Shandong	Jul 2010	Mar 2012	Prospective cohort study	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999			√
Zhang 2012b	moderate	Fujian	Jul 2010	Jun 2011	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		
Zhang 2013a	moderate	Jiangxi	Jan 2010	Jan 2013	Surveillance	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999			√
Zhang 2013b	low	Shaanxi	Jul 2011	Jun 2012	Surveillance	ICU	Non-tertiary	Criteria by the Chinese Ministry of Health in 2001	√		
Zhang 2014a	low	Henan	Jan 2012	Dec 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√		
Zhang 2014b	moderate	Henan	Jan 2014	Jun 2014	Surveillance	NICU	Tertiary	Criteria by the Chinese	√		

								Ministry of Health in 2001		
Zhang 2014c	low	Jiangsu	Jan 2011	Dec 2011	Surveillance	NICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Zhang 2015a	moderate	Hebei	Jan 2013	Jan 2014	Prospective cohort study	ICU	Tertiary	Criteria by Chinese Thoracic Society in 1999		√
Zhang 2015b	high	Xinjiang	Jan 2010	Dec 2014	Surveillance	ICU	Tertiary	Unclear	√	
Zhang 2015c	moderate	Chognqing	Jan 2012	Sep 2012	Prospective cohort study	PICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√	√
Zhao 2012a	moderate	Guangdong	Jan 2009	Dec 2011	Surveillance	Unclear	Tertiary	Others		√
Zhao 2012b	moderate	Hebei	Jan 2012	Jul 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Zhao 2013	low	Hubei	Jan 2012	Dec 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Zhao 2014a	low	Guangdong	Jan 2012	Jan 2012	Surveillance	ICU	Tertiary	Others		√
Zhao 2014b	moderate	Guangdong	Jan 2012	Dec 2012	Surveillance	Pediatric cardiac ICU	Tertiary	Unclear	√	
Zhao 2015	moderate	Hebei	Jan 2013	Dec 2013	Prospective cohort study	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Zhong 2013	high	Sichuan	Jan 2011	Oct 2011	Prospective cohort study	ICU	Non-tertiary	Unclear		√
Zhou 2013a	moderate	Jiangsu	Jan 2011	Dec 2012	Surveillance	ICU	Tertiary and Non-tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Zhou 2013b	high	Chongqing	Jan 2011	Dec 2011	Surveillance	ICU	Non-tertiary	Unclear	√	
Zhou 2013c	moderate	Guizhou	Jan 2011	Dec 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Zhu 2010	moderate	Ningxia	Apr 2008	Mar 2009	Surveillance	Neurology ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Zhu 2014a	moderate	Tianjin	Jan 2012	Dec 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Zhu 2014b	moderate	Xinjiang	Jan 2010	Dec 2012	Surveillance	ICU	Tertiary	Unclear	√	√
Zong 2013	low	Jiangsu	Jul 2010	Jun 2011	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001		√
Zou 2013	moderate	Hubei	Jan 2011	Dec 2012	Surveillance	ICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	
Zou 2015	low	Guangdong	May 2014	May 2015	Surveillance	PICU	Tertiary	Criteria by the Chinese Ministry of Health in 2001	√	

Zuo 2015	low	Guangdong	Jan 2011	Dec 2013	Surveillance	NICU	Tertiary	Criteria by Chinese Thoracic Society in 1999	√
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^aICU=intensive care unit, NICU=neonatal intensive care unit, PICU=pediatric intensive care unit, RICU=respiratory intensive care unit, SICU= surgery intensive care unit, CCU=cardiac care unit, EICU=emergency intensive care unit.

^bOthers refer to a specified diagnostic criteria rather than the one proposed by Chinese Thoracic Society, Chinese Critical Care Medicine Society, or the Chinese Ministry of Health, which was reported in a small number of studies.

Table S4. The results of subgroup analyses by Chinese provinces and years of study

Subgroups		Studies	Sample size	Estimate (%) ^a	95%CI (%)	<i>I</i> ² (%)	<i>p</i> value ^b
Overall ^c		93	71936	23.8	20.6-27.2	98.9	-
Province	Anhui	7	1611	22.5	9.8-38.5	97.5	<0.001
	Beijing	5	370	28.1	23.6-32.7	0.0	
	Chongqing	1	30	70.0	52.7-84.8	-	
	Fujian	3	1201	7.5	5.9-9.4	22.4	
	Gansu	1	54	29.6	18.3-42.4	-	
	Guangdong	8	3931	16.9	10.9-24.0	96.0	
	Guangxi	3	340	31.2	12.3-54.1	91.6	
	Guizhou	1	319	25.7	21.1-30.6	-	
	Hebei	6	1206	27.8	13.4-45.0	96.6	
	Heilongjiang	2	82	20.7	12.7-30.1	0.0	
	Henan	4	2083	17.7	11.3-25.2	92.1	
	Hubei	4	4760	24.7	14.4-36.8	96.1	
	Jiangsu	8	8464	18.8	10.4-28.9	98.9	
	Jiangxi	10	11185	29.5	17.0-43.7	97.3	
	Inner Mongolia	1	213	32.9	26.7-39.3	-	
	Qinghai	1	146	14.4	9.2-20.5	-	
	Shaanxi	1	96	16.7	9.9-24.7	-	
	Shandong	3	1128	27.5	8.8-51.7	97.8	
	Shanghai	4	29715	17.8	5.4-35.2	99.2	
	Shanxi	4	559	39.8	30.5-49.5	81.2	
	Sichuan	7	2227	15.0	8.3-23.4	95.4	
	Xinjiang	2	819	34.5	28.4-40.9	69.1	
	Zhejiang	7	1277	30.3	22.1-39.3	90.2	
Year of study	2006	1	105	49.5	40.0-59.0	-	<0.001
	2007	5	29436	33.8	7.8-67.0	99.6	
	2008	7	5213	29.2	21.1-38.1	94.7	
	2009	19	6672	22.2	17.7-27.0	94.0	
	2010	22	12805	21.4	15.7-27.7	98.2	
	2011	22	7170	24.6	18.0-32.0	97.6	
	2012	17	4848	16.0	11.0-21.8	96.0	
	2013	12	1734	19.3	14.0-25.2	87.7	
	2014	1	56	19.6	10.4-31.0	-	

CI, confidence interval.

^aPooled estimates were calculated by a random-effects model.

^bThe Q test for heterogeneity was used to compare the incidence across subgroups.

^c Studies that reported the cumulative incidence of VAP

Table S5. Summary of diagnostic requirements for the three published sets of criteria in mainland China

Published criteria	Clinical and radiography criteria	Microbiology criteria
the Chinese Ministry of Health in 2001	<ul style="list-style-type: none"> • Cough, sputum or moist rales • At least one criterion: <ul style="list-style-type: none"> – Fever – Elevated white blood cell count and/or neutrophil percentage – Inflammatory infiltrates on chest X-ray 	<ul style="list-style-type: none"> • At least one criterion: <ul style="list-style-type: none"> – The same pathogens detected in two consecutive sputum samples – Quantitative sputum culture $\geq 10^6$ cfu/ml – Positive growth in blood culture or culture of pleural fluid – Lower respiratory tract secretions collected via bronchoscopy be cultured for microorganisms $\geq 10^5$ cfu/ml, BAL samples be cultured for microorganisms $\geq 10^4$ cfu/ml, or pathogens detected in PSB or PBAL samples – Uncommon pathogens detected in sputum or lower respiratory tract samples – Abnormal immunology tests or histopathological evidence of pneumonia
Chinese Thoracic Society in 1999	<ul style="list-style-type: none"> • At least one criterion: <ul style="list-style-type: none"> – The advent of cough, sputum or existing respiratory symptoms, and purulent sputum – Fever – Pulmonary consolidation syndrome and/or moist rales – White blood cell count $> 10 \times 10^9/L$ or $< 4 \times 10^9/L$, with or without an accompanying shift to the left • Patchy infiltrate shadows or interstitial change on chest X-ray, with or without pleural effusion 	—
Chinese Critical Care Medicine Society in 2013	<ul style="list-style-type: none"> • New or progressive infiltrates on chest X-ray • At least two criteria: <ul style="list-style-type: none"> – Temperature $> 38^\circ\text{C}$ or $< 36^\circ\text{C}$ – White blood cell count $> 10 \times 10^9/L$ or $< 4 \times 10^9/L$ – Purulent secretions 	—

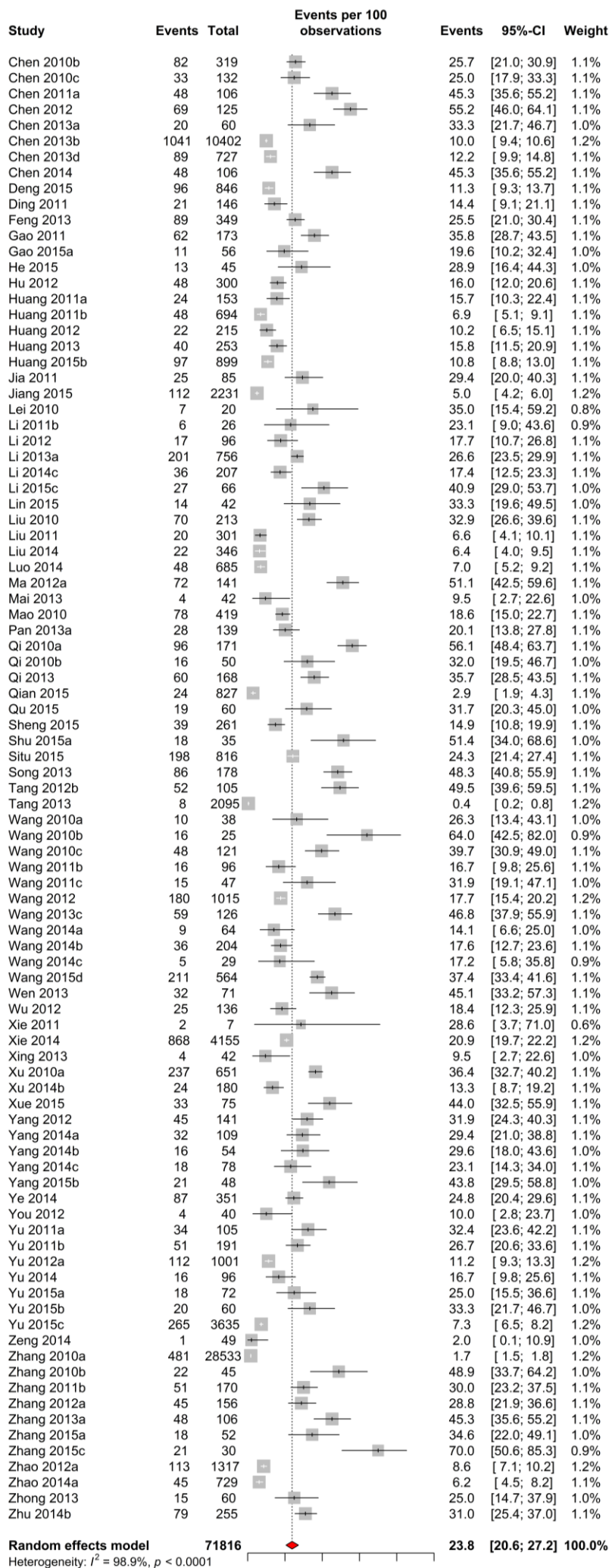


Figure S1. Forest plot of the cumulative incidence of ventilator-associated pneumonia (VAP) using a random-effects model.

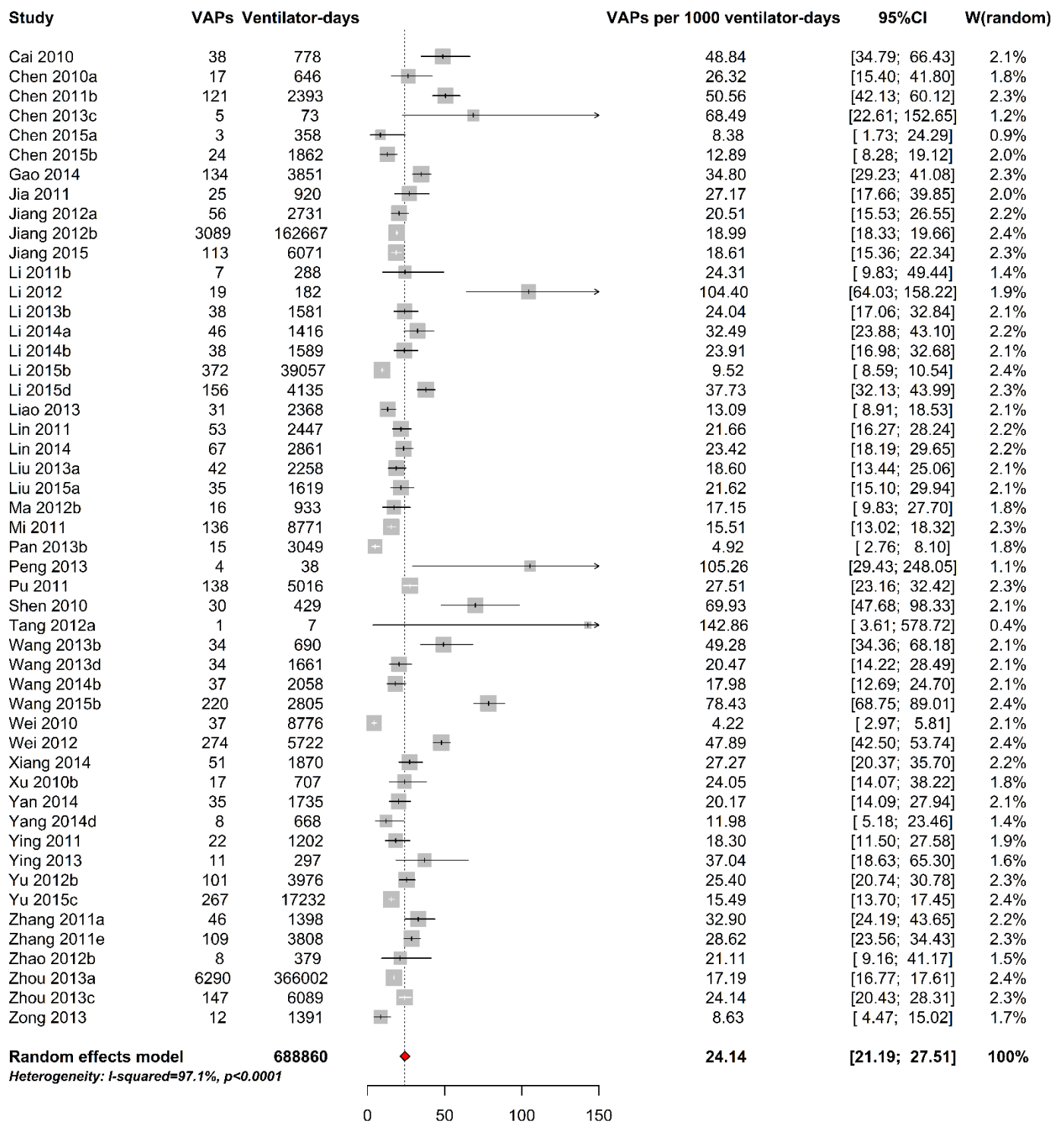


Figure S2. Forest plot of the incidence density (reported as episodes per 1000 ventilator-days) of ventilator-associated pneumonia (VAP) using a random-effects model.

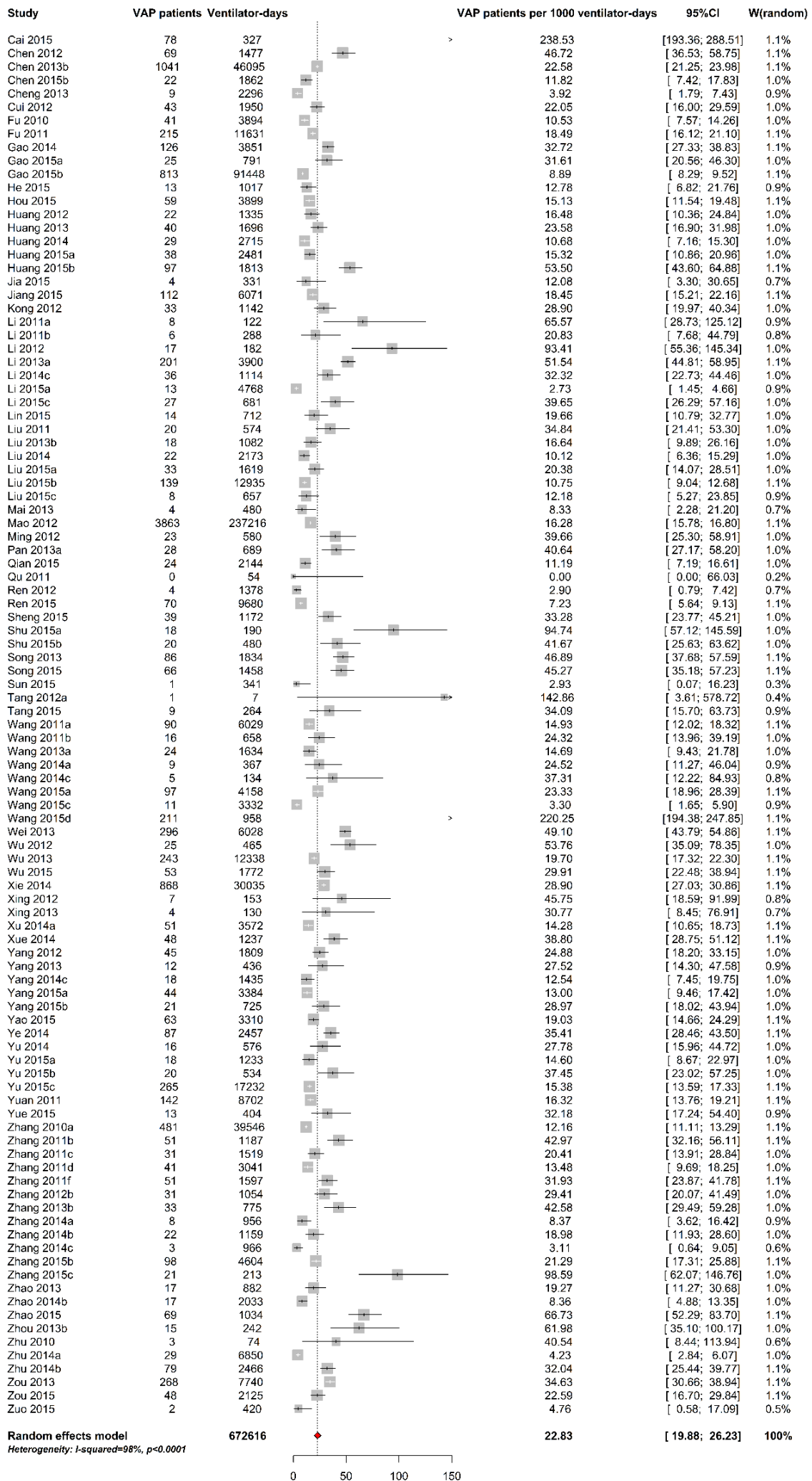


Figure S3. Forest plot of the incidence density (reported as patients per 1000 ventilator-days) of ventilator-associated pneumonia (VAP) using a random-effects model.