Supplement Table 1. The characteristics of included studies

Study ID	Country	Study type	Date	Quality score	N. Cases	Age,	Gender (F/M)	Hospital	Sampling time	virus	Methods	Diagnosis of enrolled patients	Detective rates	Ranking	Ref.(N.)
Larios etal., 2011[1]	Canada	C.T.	Oct. 2008	7	60	41.1(Y/Median)	43/17	Mount Sinai Hos.	After symptom onset	RVs	MTS/NPS (PCR)	Acute respiratory illnesses	90%(MTS)/86%(NPS)	MTS > NPS	17
Wouters etal.,2019 [2]	Belgium	C.T.	Inf. season 2015 – 2016	7	321	NA	157/164	Heilig Hart Hos. Lier	After symptom onset	INF/RSV	NPS/MTS(PCR)	Influenza-like illness	48.5%(NPS)/46.0%(MTS)	NPS > MTS	11
Abu-Diab2008[3]	Palestinian	C.T.	Nov.2006 - Jan. 2007	7	455	I7.4 (M/Mean)	175/280	Caritas Baby Hos.	After symptom onset	RVs	VTM-S /NPA (DFA)	Viral respiratory infections	71.4%(NPA)/70.3%(VTM-S)	VTM-S =NPA	16
Frazee etal.,2017 [4]	USA /Chile	C.T.	Inf.season 2015 - 2016	7	484	34(Y/Median)	284/285	NA	After symptom onset	INF	NPS/MTS/NS(PCR)	Influenza-like illness	98% （MTS）/84.4(NS)/93.0(NPS)	MTS > NPS > NS	44
Ngaosuwankul etal.,2010 [5]	Thailand	C.S.	2009 pandemic Inf.	5	29	12.9(Y/Mean)	NA	Medicine Siriraj Hos.	After symptom onset	INF	NPA/NS/TS (PCR)	Respiratory viral infections	100%(NPA)/100%(NS)/86.2%(TS)	NPA= NS > TS	15
Irving etal.,2012	USA	C.T.	Jan.- Mar.	7	240	60(Y/Median)	151/89	NA	After symptom	INF	NS/NPS (PCR/cultur	Acute respiratory	88.6%(NS)/94.3%(NPS)	NS=NPS	15

[6]			2007						onset		e)	illnesses			
Jin etal., 2014[7]	China	C.T.	Apr. -May 2013	6	35	NA	NA	The 1st AffiliatedHos.ofZhejiangUniversity	After symptom onset	INF	Sputum/TS(IDA /Culture/PCR)	H7N9 infection	98.2%(Sputum)/62.2%(TS)	Sputum > TS	18
Ali etal., 2015[8]	Canada	C.T.	Sep.2011 -Mar. 2013,	6	83	NA	NA	NA	After symptom onset	RVs	TS/NS(PCR)	Respiratory viral infections	87.7%(NS)/71.4%(TS)	NS > TS	17
Bell etal., 2014[9]	USA	C.T.	Aug. 2009 -Jun. 2012	5	236	NA	NA	Children's Mercy Hos.s and Clinics	After symptom onset	INF	MTS/NPW(culture/PCR)	Influenza	89.4%(NPW)/(87.1%(MTS)	MTS=NPW	29
Faden etal.,2010 [10]	USA	C.T.	Jan. - Mar. 2010	6	153	NA	NA	Women and Children's Hos. of Buffalo	After symptom onset	RVs	MTS/NPA(DFA)	Respiratory viral infections	93.4%(NPA)/93.2%(MTS)	MTS=NPA	7
Tabla etal., 2010[11]	Spain	C.T.	July - Dec. 2009	7	264	38(Y/Median)	129/135	the San Juan University Hos.	After symptom onset	INF	N-TS/NPA(PCR)	Pandemic influenza	95%(N-TS)/85%(NPA)	N-TS > NPA	18
Lambert etal.,2014 [12]	Australia	C.S.	Jul. 2006-Aug. 2007	6	295	1.1(Y/Median)	NA	Royal Children ' s Hos.	After symptom onset	RVs	N-TS/NPA(PCR	Respiratory viral infections	96.7%(NPA)/86.6%(N-TS)	NPA > N-TS	24

Holter etal.,2015 [13]	Norway	C.T.	Jan. 2008-Jan. 2011	6	267	66(Y/Median)	127/140	Drammen Hos.	After symptom onset	Resp.pathogens	NPS/OPS （antigen Test/culture / PCR）	Community-acquired pneumonia	59.1%(NPS)/86.4%(OPS)	OPS > NPS	44
Lieberman etal.,2009 [14]	Israel	C.T.	Jan.-Mar. 2004, etal	8	550	63.9(Y/Mean)	255/295	Soroka Medical Center	After symptom onset	RSV	NPW/NPS/OPS(PCR)	Respiratory viral infections	54.2%(OPS)/73.3%(NPS)/84.9% （NPW）	NPW > NPS > OPS	16
Hernes etal.,2011 [15]	Norway	C.T.	Feb. 2008-Feb. 2009	7	223	74.9(Y/Mean)	89/134	Sorlandet Hos.	After symptom onset	RVs	NPS/OPS(PCR)	Respiratory viral infections	72.2%(NPS)/64.8%(OPS)	NPS > OPS	29
Hammitt etal., 2011[16]	UK	C.T.	Oct. 2009 -Aug. 2010	6	533	18(M/Median)	236/297	Kilifi District Hos.	After symptom onset	RVs	NPS/OPS(PCR)	Lower respiratory tract Infection	91.9%(NPS)/72.4%(OPS)	NPS > OPS	11
Goyal etal., 2017[17]	Thailand	C.S.	Feb. -Dec.2015	5	108	73(Y/Mean)	59/49	NA	After symptom onset	INF	NPS/NS(PCR)	Influenza	87.5%(NS)/77.7%(NPS)	NPS=NS	20
Kim etal., 2011[18]	Kenya	C.T.	Jun. 2009 -Aug. 2010	8	2331	1(Y/Median)	1074/1257	Kenya Medical ResearchInstitute	After symptom onset	INF	NPS/OPS (PCR)	Respiratory viral infections	70.1%(NPS)/73.7%(OPS)	NPS=OPS	25
Covalciuc etal., 1999[19]	USA	C.T.	Jan. 1998 -Apr.	7	184	NA	NA	NA	After symptom onset	INF	NPS/Sputum/TS/NA(OIA/culture)	Influenza	88.4%(NA)/83.1%(NPS)/81.1%(Sputum)/62.1	NPS/Sputum/NA > TS	24

			1998									%(TS)		
Spyridaki etal., 2009[20]	Greece	C.T.	NA	8	58	39.2 (Y/ Mean)	35/23	Amsterdam / Lodz/Oslo Hos.	After symptom onset	INF	NS/NA/NB/ NW(PCR)	Viral pathogens infection	79%(NA)/74%(NB)/77%(NS)/ 88%(NW)	NW > NS/NA > NB	38
TUNSJØ etal.,2015 [21]	Norway	C.S.	2012/2 013 RSV season	6	81	NA	NA	Akershus University Hos.	After symptom onset	Resp. pathog ens	NPS/NPA (PCR)	Respiratory viral infections	71.2%(NPS)/67 .2%(NPA)	NPS=NPA	16
Sung etal.,2008 [22]	Hong Kong	C.T.	Nov. 2005 - Oct. 2006	7	475	23.8 (M/Me an)	222/253	Prince of Wales Hos.	After symptom onset	RSV	NPA/NS (PCR)	Acute viral respiratory infection	85.6%(NPA)/7 6.7%(NS)	NPA=NS	10
Mitamura etal., 2013[23]	Japan	C.S.	Dec.20 10 - Mar. 2011	6	336	NA	NA	Eiju General Hos.	After symptom onset	INF	NPA/NPS/ NW(IFA)	Pandemic influenza	97.3%(NPA)/9 1.9%/(NPS)75. 7%(NW)	NPA/NPS > Nw	17
Campbell etal., 2013[24]	USA	C.T.	NA	6	146	NA	NA	Seattle Children's Hos.	After symptom onset	RVs	NS/NW(PC R)	Respiratory viral infections	91.3%(NW)/85 .8%(NS)	NS=NW	22
Masters etal.,1987 [25]	USA	C.S.	Winter - spring 1986	5	121	NA	NA	Universityof Colorado Health Sciences Center	After symptom onset	RSV	NPS/NPW (EIA/FAT/ Culture)	RSV infection	44.1%(NPW)/2 1.7%(NPS)	NPW > NPS	16
Jeremiah etal.,	USA	C.T.	Dec. 2011-A	6	1174	NA	520/654	NA	After symptom	RSV	NPS/NPW(c ulture/PCR)	RSV infection	NA	NA	28

2014[26]			pr.2012						onset					
Agoritsas etal., 2006[27]	USA	C.T.	Inf .2003-2004 and 2004-2005	8	122	5(Y/Mean)	58/64	Columbus Children's Hos.	After symptom onset	INF	NPS/NS/NPW(culture/PCR)	Influenza	78%(NS)/85%(NPS)/ 69%(NPW)	NPS > NS > NPW	21
Steven etal., 1989[28]	USA	C.T.	Jan. - Mar. 1988	7	32	NA	NA	Johns Hopkins Hos.	After symptom onset	RSV	NB/NPA(IFA/Culture)	RSV infection	100%(NPA)/ 94%(NB)	NB=NPA	10
Yoon etal.,2017 [29]	Republic of Korea	C.S.	Dec.2014-Apr. 2015	7	385	46(Y/Median)	206/179	Korea University Guro Hos.	After symptom onset	INF	NPS/ saliva(PCR)	Influenza	93.5% (NPS)/ 97.1% (Saliva)	NPS= saliva	15
Robinson etal.,2013 [30]	Canada	C.S.	Nov.2006-Feb .2007	7	137	4.9(M/Median)	75/62	the Stollery Children ' s Hos.	After symptom onset	RVs	TS/Saliva(PCR)	Respiratory viral infections	83%(TS)/74%(Saliva)	TS > Saliva	7
Bilder etal., 2011[31]	Israel	C.T.	Nov. 1- Dec. 2009	6	26	46.6(Y/Median)	14/12	Rambam Hos.,	After symptom onset	H1N1 Virus	NPS/Saliva(PCR)	H1N1 Virus infection	92.3(Saliva)%/ 92.3%(NPS)	NPS > Saliva	33
Yoshii etal., 2017[32]	Japan	C.T.	Aug. 2012 -Mar. 2014	5	64	55.1(Y/Mean)	41/23	Jikei UniversityDaisan andToranomon Hos.	After symptom onset	RVs	NPS/Sputum(PCR/culture)	Bronchial asthma	89.2%(NPS)/60.7%(Sputum)	NPS > Sputum	37
Thea etal.,	USA	C.S.	NA	6	1114	NA	NA	NA	After symptom	RVs	NPS(OPS)/Sputum(PCR)	Pneumonia	92.3%(NPS/OPS)/91.5%(Sput	NPS(OPS)=Sputum	34

2017[33]									onset				um)		
S ´ álvia etal., 2016[34]	Spain	C.T.	Sep. 2012 - Aug. 2014	5	368	7.43(Y/ Mean)	NA	Parc Taulí University Hos.	After symptom onset	RVs	NPS/Sputum(PCR/culture)	Infection with cystic fibrosis	NA	NA	12
Azadeh etal.,2015 [35]	USA	C.T.	Jun.2013- May 2014	7	86	60 （Y/ Mean）	46/50	Mayo Clinic	After symptom onset	Inf./RSV	NPS/BAL(PCR)	Respiratory infections	57.1%(NPS)/91.4%(BAL)	BAL > NPS	12
Hassan etal.,2018 [36]	USA	C.S.	2015-2016 Resp.season	7	497	NA	NA	NA	After symptom onset	RSV	NPS/VTM-S(DFA）	RSV infection	98.6%(NPS)/98.6%(VTM-S)	NPS=VTM-S	26
Heikkinen etal.,2001 [37]	Finland	C.T.	Inf. epidemic of 1998-9	6	101	13 (M/Median)	48/53	Turku University Hos.,	After symptom onset	INF	NS/NPA(culture)	Influenza	100%(NPA)/91.3%(NS)	NS=NPA	5
Walsh etal.,2008 [38]	USA	C.S.	NA	5	181	NA	NA	NA	After symptom onset	RVs	NS/NA/VTM-A(PCR)	Respiratory viral infections	71%(NA)/99%(VTM-S)/92%(VTM-A)	VTM-S/VTM-A > NA	9
Heikkinen etal.,2002 [39]	Finland	C.S.	Oct. 1999 - Jun. 2000.	7	230	10 (M/Median)	80/150	Turku University Hos.	After symptom onset	RVs	VTM-S/VTM-A	Respiratory viral infections	92.7%(VTM-A)/80.6%(VTM-S)	VTM-S= VTM-A	17
Kim etal.,2016 [40]	Republic of Korea.	C.T.	Nov.2015 -Jan.	6	236	22(Y/Median)	136/100	Anam Hos.of Korea	After symptom onset	RVs	NPS/Saliva(PCR)	Acute respiratory illnesses	77.5%(NPS)/76.3%(saliva)	NPS=Saliva	33

			2016					University							
Jeong etal.,2014 [41]	Republic of Korea	C.T.	Nov. 2012-Mar. 2013	7	154	52(Y/Median)	107/47	Gachon University Gil Medical Center	After symptom onset	RVs	NPS/Sputum(PCR)	Respiratory viral infections	53.6%(NPS)/68.2%(Sputum)	Sputum > NPS	16
Ahluwalia etal., 1987[42]	Canada	C.S.	Jan.-Apr. 1986	6	32	4 (M/Median)	NA	NA	After symptom onset	RSV	NPA/NPS(Culture, IFA,ELISA)	RSV infection	69%(NPA)/61%(NPS)	NPA= NPS	26
Spencer etal., 2013[43]	USA	C.T.	2010-2011 seasonal Inf.	8	268	42(Y/Mean)	233/35	NA	After symptom onset	INF	NPS/OPS/NS(PCR)	Respiratory specimen influenza	86.8%(NPS)/86.8%(OPS)/75.5%(NS)	NPS=OPS > NS	11
Chan etal., 2008[44]	China	C.T.	Feb.-May 2007	7	196	6.3(M/Mean)	83/113	Queen Mary Hos.	After symptom onset	RVs	NPS/NPA (DIF/ PCR)	Respiratory viral infections	94.4%(NPA)/90%(NPS)	NPS=NPA	16
Frayha etal., 1989[45]	Canada	C.S.	NA	6	125	10.3 (M/Mean)	NA	St. Joseph's Hos.	After symptom onset	RVs	NPA/NPS （IFA/Culture）	Viral respiratory disease	52.7%(NPA)/50.6%(NPS)	NPA=NPS	20
DeByle etal.,2012 [46]	USA	C.S.	Oct. 2005 - Sep. 2007	6	314	7.3 (M/Median)	141/163	Yukon-Kuskokwim Delta Hos.	After symptom onset	RVs	NPS/NW(PCR)	Respiratory tract infection	90.3%(NW)/76.8%(NPS)	NPS < NW	24
Yoshii etal.,2016 [47]	Japan	C.T.	Dec.2012-May 2014	6	92	63.3(Y/Mean)	33/59	Jikei University Daisan and Toranomon	After symptom onset	RVs	NPS/Sputum(PCR)	Community-acquired pneumonia	15%(NPS)/10%(Sputum)	NPS=Sputum	36

								Hos.						
Li etal.,2013 [54]	China	C.S.	Dec.2011-Dec.2012	7	103	28.9(Y/Mean)	60/43	1st affiliated Hos. of Guangzhou university	After symptom onset	RVs	NPS/OPS/NW(PCR)	Acute pharyngitis	74%(NPS)/44%(OPS)/44%(NW)	NPS > OPS/NW	46
Stensballe etal.,2002 [65]	Denmark	C.T.	1996–98	6	635	NA	NA	National Hos. in Bissau, local health centre in Bandim	After symptom onset	RSV	NPA/NS (ELISA/antigen)	RSV infection	97.6%(NPA)/71.4%(NS)	NPA > NS	19
Doorn etal., 2012[66]	Vietnam	C.T.	Feb.-Nov.2010	7	569	25(M/Median)	268/301	Children's Hos.etal	After symptom onset	INF	NS/TS(PCR)	Influenza	73.6%(NS)/52.4%(TS)	NS > TS	18
Ye etal.,2018 [67]	China	C.T.	2016 May-2017 Apr.	6	34961	3.43(Y/Mean)	16108/18851	Zhejiang University Children ' s Hos.	After symptom onset	RVs	NPS/Sputum	Respiratory viral infections	72.5%(NPS)/60.9%(Sputum)	NPS > Sputum	32
Macfarlane etal., 2005[68]	UK	C.T.	NA	7	88	6 (M/Mean)	NA	Rotherham General Hos.	After symptom onset	RSV	NS/NPA (IFA)	Bronchiolitis	25%(NS)/37.5%(NPA)	NPA > NS	7
Waris etal., 2007[69]	Finland	C.T.	Nov.2003-Feb.2004	6	112	NA	NA	Turku University Hos.	After symptom onset	RSV	NS/NPA(PCR/IFA)	RSV infection	72.3%(NS)/70.5%(NPA)	NS=NPA	4
Sung	Hong Kong	C.S.	Oct.20	7	475	NA	222/253	Prince of	After	RVs	NPA/NS	Acute viral	78.4%(NS)/93%	NPA > NS	5

etal.,2009 [70]			05 -Dec. 2006.					Wales Hos.	symptom onset		(IFA/ culture/PCR)	respiratory infections	(NPA)		
Meerhoff etal., 2010[71]	Netherlands	C.T.	Apr.2006 – Apr. 2008	7	98	3.5(M/ Median)	41/57	University Medical Centre Utrecht	After symptom onset	INF	NS/NPA(PCR)	Influenza	92%(NPA)67%(NS)	NPA > NS	30
Pongthanapisith etal.,2012 [72]	Thailand	C.S.	2009 pandemic Inf	6	210	5(Y/Median)	NA	Ramathibodi Hos.	After symptom onset	INF	NPS/Sputum/TS(PCR)	Novel swine-origin INF	84%(Sputum)/ 60%(NPS)/36.(TS)	Sputum > NPS > TS	35
Öhrmalm 20 etal.,2010 [73]	Sweden	C.S.	Jan. 2008 -May 2009	6	89	55(Y/ Mean)	13/55	Karolinska University Hos.	After symptom onset	RVs	NS/NPA(PCR)	Respiratory tract viruses	90%(NPA)/65% (NS)	NPA > NS	18

Abbreviation: NPS=Nasopharyngeal swabs;NS=Nasal swab; MTS=Mid-turbinate swab;OPS=Oropharyngeal swab;TS=Throat swab;TS=Nose-Throat swab; NPA=Nasopharyngeal aspirate;NA=Nasal aspirate;NW=Nasopharyngeal wash; NS=Nasal wash;NB=Nasal brush;BAL=Bronchoalveolar Lavage;VTM-S=Swab with viral transport medium; VTM-A=Aspirate with viral transport medium;RVs=Respiratory viruses;INF=Influenza virus; INFa=Influenza a;INFb=Influenza b;RV=Rhinovirus;RSV=Respiratory syncytial virus; PIV=Parainfluenza virus;ADV=Adenovirus;COV=Coronavirus;NA=Not applicable.