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Insights into PARDS in Asia through a sustainable research network

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October 2018

No conflict of interest

Overview

- Establishing the need for Pediatric Acute & Critical Care Medicine Asian Network (PACCMAN)
- History of PACCMAN
- Epidemiology of PARDS in Asia
- Future Directions/Conclusion

frontiers in PEDIATRICS

ORIGINAL RESEARCH ARTICLE
published: 25 July 2014
doi: 10.3389/fped.2014.00078

Epidemiology of pediatric acute respiratory distress syndrome in Singapore: risk factors and predictive respiratory indices for mortality

*Judith Ju-Ming Wong[1], Tsee Foong Loh[2,3], Daniela Testoni[4], Joo Guan Yeo[2], Yee Hui Mok[2] and Jan Hau Lee[2,3]**

Characteristic	Survivors ($n=26$)	Non-survivors ($n=44$)	*P*-value
Age (years)	4.4 (1.0, 8.8)	7.7 (1.4, 11.1)	0.331
Age category			
<2 years	7 (35%)	13 (65%)	0.670
2–12 years	15 (44%)	21 (56%)	
>12 years	4 (29%)	10 (71%)	
Weight (kg)	15.8 (10.0, 25.0)	18.0 (8.7, 35.5)	0.589
PRISM 2 score	8.5 (4.5, 14.8)	12.5 (7, 20.0)	0.121
PELOD score	11.5 (1, 12.0)	12 (1, 24.8)	0.156
Multiorgan dysfunction[a]	16 (62%)	40 (91%)	0.008*
Presence of comorbidities	8 (31%)	31 (70%)	0.001*
Neuromuscular	1	6	
Cardiovascular	0	4	
Respiratory	1	6	
Renal	0	0	
Gastrointestinal	0	2	
Hematology–oncology	2	16	
Metabolic	1	0	
Genetic/congenital	3	2	

- Small numbers
- Can we improve our outcomes?
- Is our experience similar in other countries in the region?

Incidence and Mortality of Acute Respiratory Distress Syndrome in Children: A Systematic Review and Meta-Analysis

Laura R. A. Schouten, MD[1,2,3]; Floor Veltkamp, MSc[1]; Albert P. Bos, MD, PhD[1]; Job B. M. van Woensel, MD, PhD[1]; Ary Serpa Neto, MD, PhD[3,4]; Marcus J. Schultz, MD, PhD[2,3]; Roelie M. Wösten–van Asperen, MD, PhD[1]

Crit Care Med 2016

Mortality in Pediatric Acute Respiratory Distress Syndrome: A Systematic Review and Meta-Analysis

Judith Ju-Ming Wong, MBBCh, BAO, MRCPCH[1,2], Mark Jit, BSc, PhD, MPH[3,4], Rehena Sultana, MSc[5], Yee Hui Mok, MBBS, MRCPCH[2,6], Joo Guan Yeo, MBBS, MRCPCH[2,6], Jia Wen Janine Cynthia Koh, GCE A-Levels[7], Tsee Foong Loh, MBBS, MRCPCH[2,6], and Jan Hau Lee, MBBS, MRCPCH, MCI[2,6]

Journal of Intensive Care Medicine 2017

Tale of Two Systematic Reviews

Schouten et al.

- Aims:
  - Estimate population incidence
  - Estimate mortality
- Medline, Embase, CINAHL
- 1994 – August 2014
- Include both retrospective and prospective studies
- Excluded studies with < 10 patients

29 - 32 studies

Wong et al.

- Aims: Describe mortality over time
- Medline, Embase and Web of Science
- 1960 – August 2015
- Included prospective studies only
- Excluded studies with < 20 patients

29 studies

Schouten et al. *Crit Care Med* 2016
Wong et al. *Journal of Intensive Care* 2017

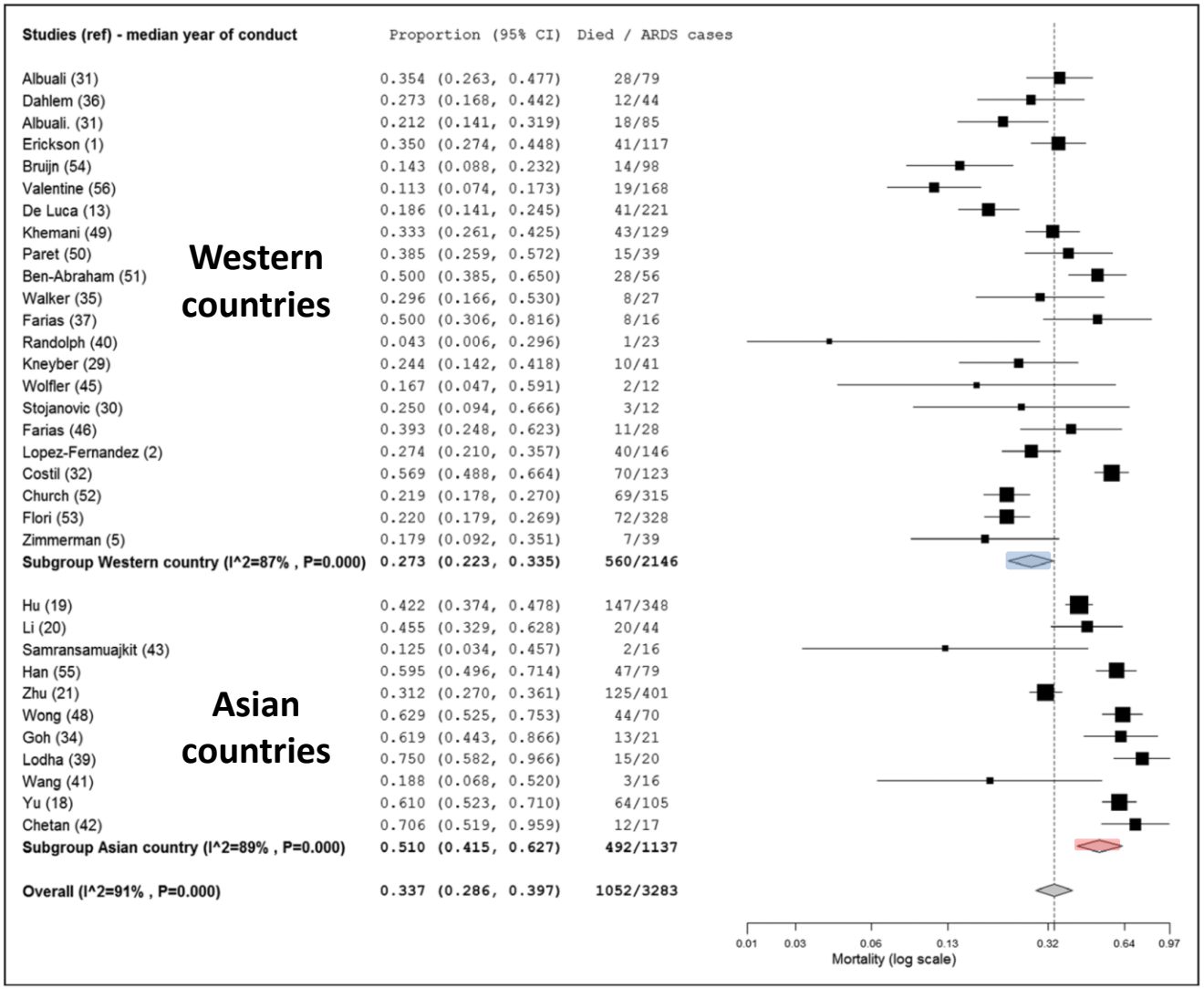
Pediatric ARDS

- Population-based incidence: 3.5 per 100,000 person years (95% CI: 2.2 – 5.7)

- PICU-based incidence: 2.3% (95% CI: 1.9 – 2.9%)

Mortality Type	Studies	Weighted Proportion (95% CI)	I^2, %
Overall mortality	33	0.34 (0.29–0.40)	91
28- to 90-d mortality	5	0.33 (0.26–0.43)	85
Hospital mortality	8	0.35 (0.25–0.49)	84
PICU mortality	12	0.26 (0.19–0.37)	92
Mortality nonspecified	8	0.52 (0.35–0.65)	74

Schouten et al. *Crit Care Med* 2016



- Higher mortality in studies performed in Asia
- No change in mortality over time in Asia

27% (95% CI: 22 – 34)

51% (95% CI: 42 – 63)

- Study design did not influence reported mortality rates

Schouten et al. *Crit Care Med* 2016

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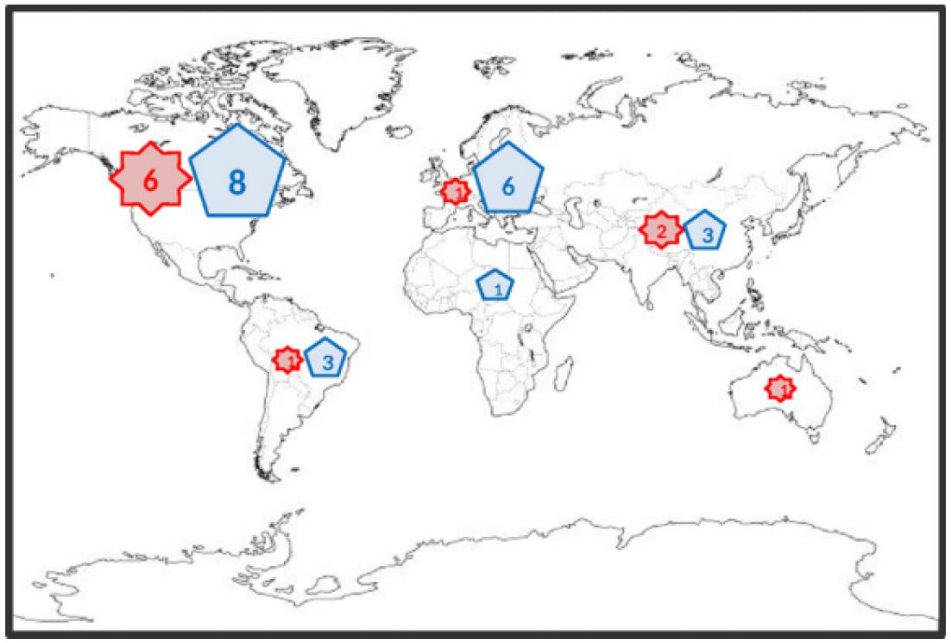
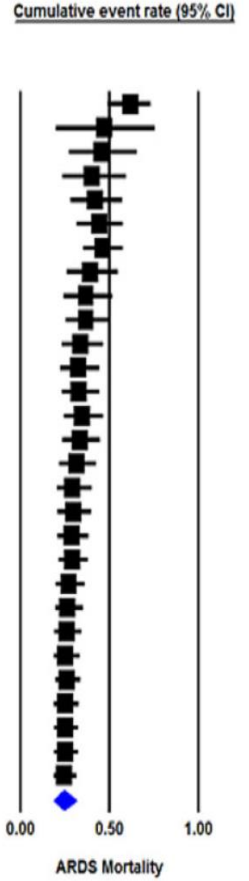


Observational studies

RCTs

Study name	Design	Total	Point	Lower limit	Upper limit
Davis, 1993	Observational	37 / 60	0.617	0.489	0.730
Smith, 1993	Observational	46 / 89	0.469	0.202	0.754
Lopez-Herce, 1999	Observational	56 / 113	0.457	0.274	0.651
Curley, 2000	Observational	62 / 138	0.401	0.237	0.591
Casada, 2002	Observational	73 / 161	0.419	0.282	0.570
Moller, 2003	RCT	82 / 177	0.440	0.317	0.572
Yapicioglu, 2003	Observational	102 / 213	0.461	0.353	0.572
Curley, 2005	RCT	106 / 264	0.392	0.259	0.544
Flori, 2005	Observational	178 / 584	0.366	0.240	0.515
Willson, 2005	RCT	205 / 659	0.366	0.256	0.493
Cui, 2009	RCT	206 / 691	0.337	0.231	0.463
Kong, 2009	Observational	210 / 716	0.321	0.222	0.440
Piastra, 2009	Observational	219 / 739	0.328	0.233	0.439
Yu, 2009	Observational	283 / 844	0.347	0.247	0.464
Zimmerman, 2009	Observational	290 / 883	0.334	0.239	0.445
Kong, 2011	Observational	291 / 916	0.313	0.221	0.422
Cruces, 2012	Observational	296 / 976	0.292	0.204	0.398
Kitchin, 2012	Observational	315 / 1039	0.294	0.211	0.393
Li, 2012	Observational	323 / 1083	0.287	0.208	0.381
Lopez-Fernandes, 2012	Observational	363 / 1229	0.289	0.216	0.375
Thomas, 2012	RCT	364 / 1310	0.270	0.199	0.355
Cruces, 2013	Observational	368 / 1335	0.265	0.196	0.347
De Luca, 2013	Observational	371 / 1359	0.258	0.192	0.338
Jacobs, 2013	RCT	372 / 1377	0.251	0.186	0.328
Samransamruajkit, 2013	Observational	384 / 1404	0.258	0.194	0.335
Wilson, 2013	RCT	389 / 1457	0.249	0.187	0.323
Barreira, 2015	Observational	403 / 1514	0.250	0.190	0.321
Bronicki, 2015	RCT	411 / 1543	0.251	0.193	0.321
Yehya, 2015	Observational	448 / 1826	0.243	0.186	0.312
I^2 = 86.34%, Q - value = -15.97, df = 28, P value < 0.0001			0.243	0.186	0.312



- Overall mortality: 24% (95% CI: 19 – 31)
- A later year of study was associated with survival [OR for mortality: 0.94; 95%: 0.94 – 0.95]
- No difference in mortality reported in observational studies and RCTs

Wong et al. *Journal of Intensive Care* 2017

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- Single center studies predominates in Asia
- Multi-center studies are mainly limited to a single country
- **Lack of pediatric critical care collaboration within Asia**
- Epidemiology may be different in Asia

Overview

- Establishing the need for Pediatric Acute & Critical Care Medicine Asian Network (PACCMAN)
- History of PACCMAN
- Epidemiology of PARDS in Asia
- Future Directions/Conclusion

2014 - 2015

May 2014

Met first two collaborators

Vietnam National Children's Hospital

Faculty of Medicine Siriraj Hospital, Mahidol University

Kept in touch
Single center study

October 2014

Discussions about the multicenter ARDS protocol – preliminary survey

Construction of online database

March 2015

IRB approval

Singapore Clinical Research Institute collaboration

June 2015

NUH National University Hospital

首都医科大学附属北京儿童医院
Beijing Children's Hospital, Capital Medical University

Quality Patient Care With Personal Touch
Hospital Umum Sarawak

KK Women's and Children's Hospital
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2016 – June 2017

Khoo Pilot Award

April 2016

June 2016

Star Research Achievement Award
Epidemiology of PARDS in Asia: A Multicenter Study

January 2017

Gold Snapshot Award
Risk Stratification in PARDS: A Multicenter Study

April 2017

1st informal meeting to moot the idea

Inaugural PACCMAN meeting

New sites joining

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June 2017 – June 2018

June 2017

Clinical Investigations

Risk Stratification in Pediatric Acute Respiratory Distress Syndrome: A Multicenter Observational Study*

Wong, Judith Ju-Ming; Phan, Huu Phuc; Phumeetham, Suwannee; Ong, Jacqueline Soo May; Chor, Yek Kee; Qian, Suyun; Samransamruajkit, Rujipat; Anantasit, Nattachai; Gan, Chin Seng; Xu, Feng; Sultana, Rehena; Loh, Tsee Foong; Lee, Jan Hau; for the Pediatric Acute & Critical Care Medicine Asian Network (PACCMAN) Less

Critical Care Medicine. 45(11):1820-1828, November 2017.

Abstract ☆ Favorites PDF © Get Content & Permissions

November 2016

SingHealth Foundation Grant
Pediatric TBI

January 2018

June 2018

Oral Presentation
Outcomes of Extra-pulmonary PARDS: A Multicenter Analysis

2nd PACCMAN meeting

Singapore WFPICCS 2018

9th Congress of the World Federation of Pediatric Intensive & Critical Care Societies

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Overview

- Establishing the need for Pediatric Acute & Critical Care Medicine Asian Network (PACCMAN)
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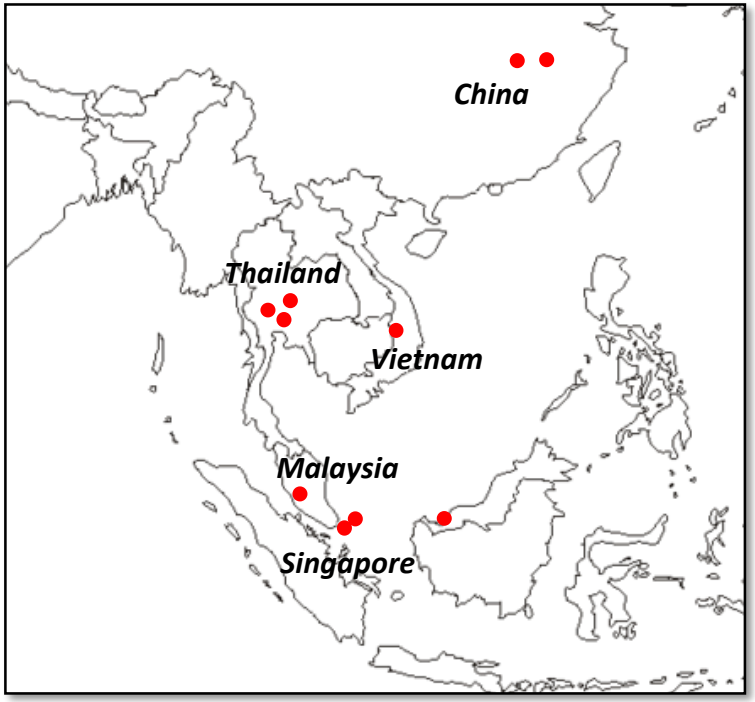
Validation of PALICC's Definition

- Multi-center, retrospective cohort study
- PARDS definition according to PALICC 2015
- Study period 2009-2015
- All patients are followed up till 100 days post diagnosis
- Included only patients on invasive mechanical ventilation



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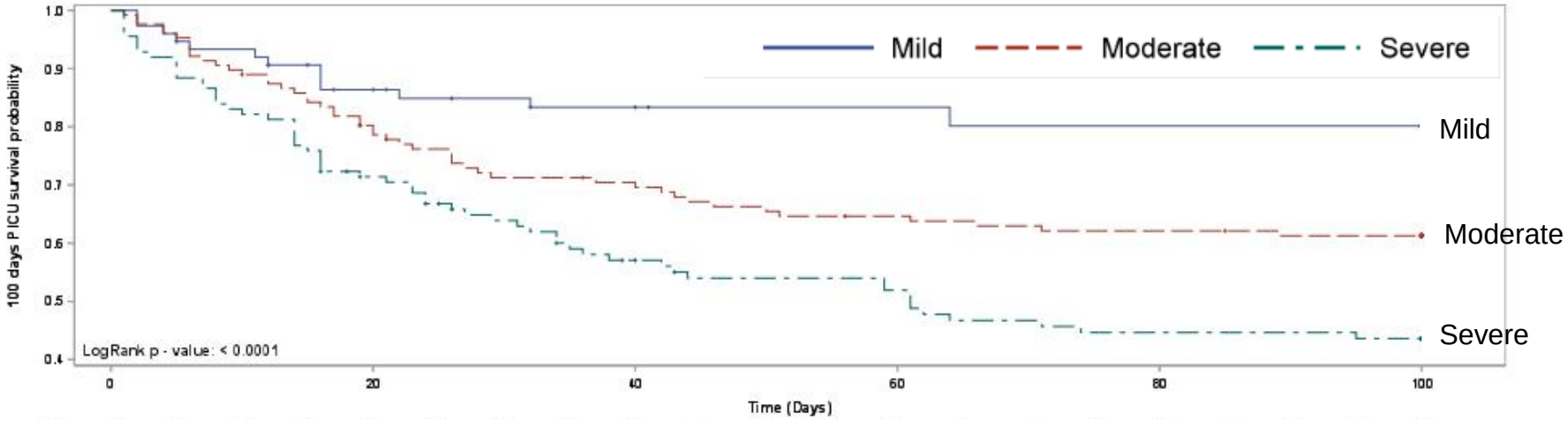
Demographics

Characteristic	Mild PARDS (n=89)	Moderate PARDS (n=149)	Severe PARDS (n=135)	p value
Age, years	1.0 (0.3,4.3)	1.0 (0.3, 4.1)	2.3 (0.7, 5.5)	0.008
Gender, male	52 (58.4)	77 (51.7)	67 (49.6)	0.419
Weight, kg	8.4 (4.7, 14)	7.8 (5, 15)	11 (7, 20)	0.001
PIM 2 score	6.9 (2.8, 13.7)	7.4 (3.5, 18.3)	9.8 (4.4, 30)	0.038
PELOD score	3 (1, 12)	3 (1, 12)	11 (2, 16)	0.048
Presence of co-morbidities	36 (40.4)	77 (51.7)	84 (62.2)	0.006
Risk factors for PARDS:				
Pneumonia	73 (82.0)	124 (83.2)	112 (83.0)	0.971
Sepsis	16 (18.0)	35 (23.5)	46 (34.1)	0.018
Aspiration	6 (6.7)	8 (5.4)	6 (4.4)	0.757
Transfusion	1 (1.1)	1 (0.7)	3 (2.2)	0.514
Trauma	0 (0)	1 (0.7)	2 (1.5)	0.465
Near drowning	5 (3.5)	6 (4.0)	3 (2.2)	0.414
OI	5.9 (4.9, 6.7)	11.3 (9.8, 13.6)	25.2 (18.5, 33.2)	< 0.001
OSI	5.52 (4.5, 7.2)	9 (7.0, 11.2)	17.1 (14.1, 22.2)	< 0.001

PICU mortality: 113/373 (30.3%)
100-day mortality: 126/314 (39.7%)

Wong et al. *Crit Care Med* 2017

100-day mortality based on PARDS severity



Severity Categories	Unadjusted Hazard Ratio	p value	Adjusted Hazard Ratio	p value
Mild	Reference		Reference	
Moderate	2.69 (1.39 – 5.19)	<0.01	2.64 (1.35 – 5.14)	<0.01
Severe	4.15 (2.17 – 7.93)	< 0.01	4.10 (2.02 – 8.32)	<0.01

Using COX Proportional hazard regression model
Adjusted for site, presence of co-morbidities and Pediatric Index of Mortality 2 score

Wong et al. *Crit Care Med* 2017

Secondary Outcomes

Parameters	All (n=373)	Mild PARDS (n=89)	Moderate PARDS (n=149)	Severe PARDS (n=135)	P value
Ventilator free days	16 (0, 23)	22 (17, 25)	16 (0, 23)	6 (0, 19)	< 0.001
Duration of MV	9 (4, 16)	6 (3, 9)	10 (5, 16)	11 (5, 21)	< 0.001
PICU free days	14 (0, 22)	19 (11, 24)	15 (0, 22)	5 (0, 20)	< 0.001
Duration of PICU stay	11 (6, 22)	9 (5, 16)	12 (7, 24)	13 (6, 25)	0.010

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Wong et al. *Crit Care Med* 2017

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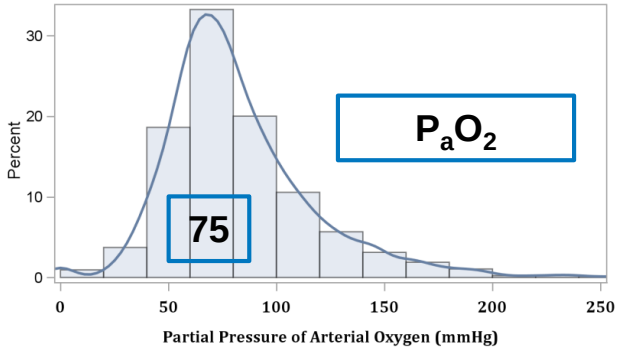
Mechanical Ventilation Settings

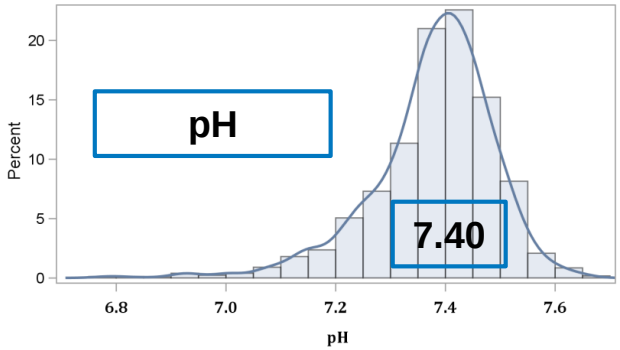
Ventilator settings, Day 1 PARDS	All (n=373)	Mild PARDS (n=89)	Moderate PARDS (n=149)	Severe PARDS (n=135)	P value
Ventilator mode					< 0.001
Pressure control	299 (80.2)	82 (92.1)	127 (85.2)	90 (66.7)	
Volume control	10 (2.7)	3 (3.4)	5 (3.4)	2 (1.5)	
APRV	38 (10.2)	3 (3.4)	13 (8.7)	22 (16.3)	
HFOV	25 (6.7)	0 (0.0)	4 (2.7)	21 (15.6)	
F_iO2, %	60 (50, 95)	45 (40, 60)	60 (50, 80)	95 (70, 100)	< 0.001
PIP, cm H_2O	24 (20, 28)	21 (19, 25)	24 (20, 27)	28 (24, 32)	< 0.001
PEEP, cm H_2O	7 (6, 9)	6 (5, 7)	7 (6, 8)	9.5 (7, 12)	< 0.001
Driving pressure, cm H_2O	17 (14, 20)	15 (14, 20)	18 (15, 19.5)	20 (16, 23)	0.002
MAP, cm H_2O	14.0 (11.4, 18.0)	11.2 (10.15, 13.0)	13.6 (11.3, 16.0)	19.0 (16.0, 24.0)	< 0.001
TV, ml/kg actual body weight	9.0 (6.3, 10.6)	8.9 (6.9, 10.3)	8.4 (6.2, 10.3)	10.0 (5.1, 10.9)	0.905

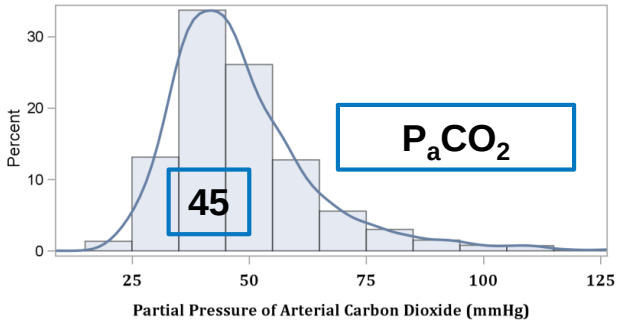
Wong et al. *Crit Care Med* 2017

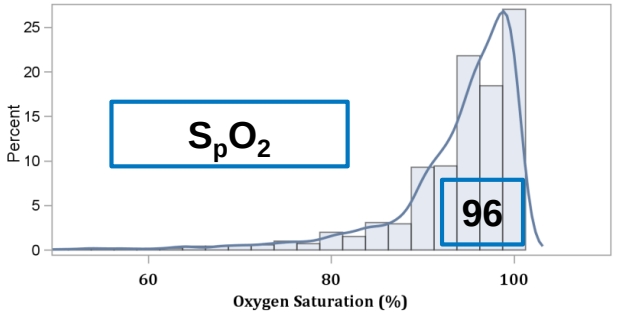
Gas Exchange Targets Achieved

Gas exchange, day 1 PARDS	Mild PARDS (n=89)	Moderate PARDS (n=149)	Severe PARDS (n=135)	All (n=373)	P value
pH	7.35 (7.28, 7.41)	7.33 (7.23, 7.4)	7.31 (7.21, 7.4)	7.33 (7.23, 7.4)	0.064
PaO2, mm Hg	87.6 (69.6, 125.1)	70.7 (57.2, 95)	61.2 (54.4, 70.9)	69.2 (57.2, 91)	< 0.001
PaCO2, mm Hg	41.9 (35.5, 55.8)	48.9 (40.5, 56.8)	47.9 (38.4, 60.3)	47.2 (37.7, 57.5)	0.011
SpO2, %	98 (95, 100)	95 (91, 98)	93 (87, 98)	95 (91, 98)	< 0.001









Wong et al. *Crit Care Med* 2017

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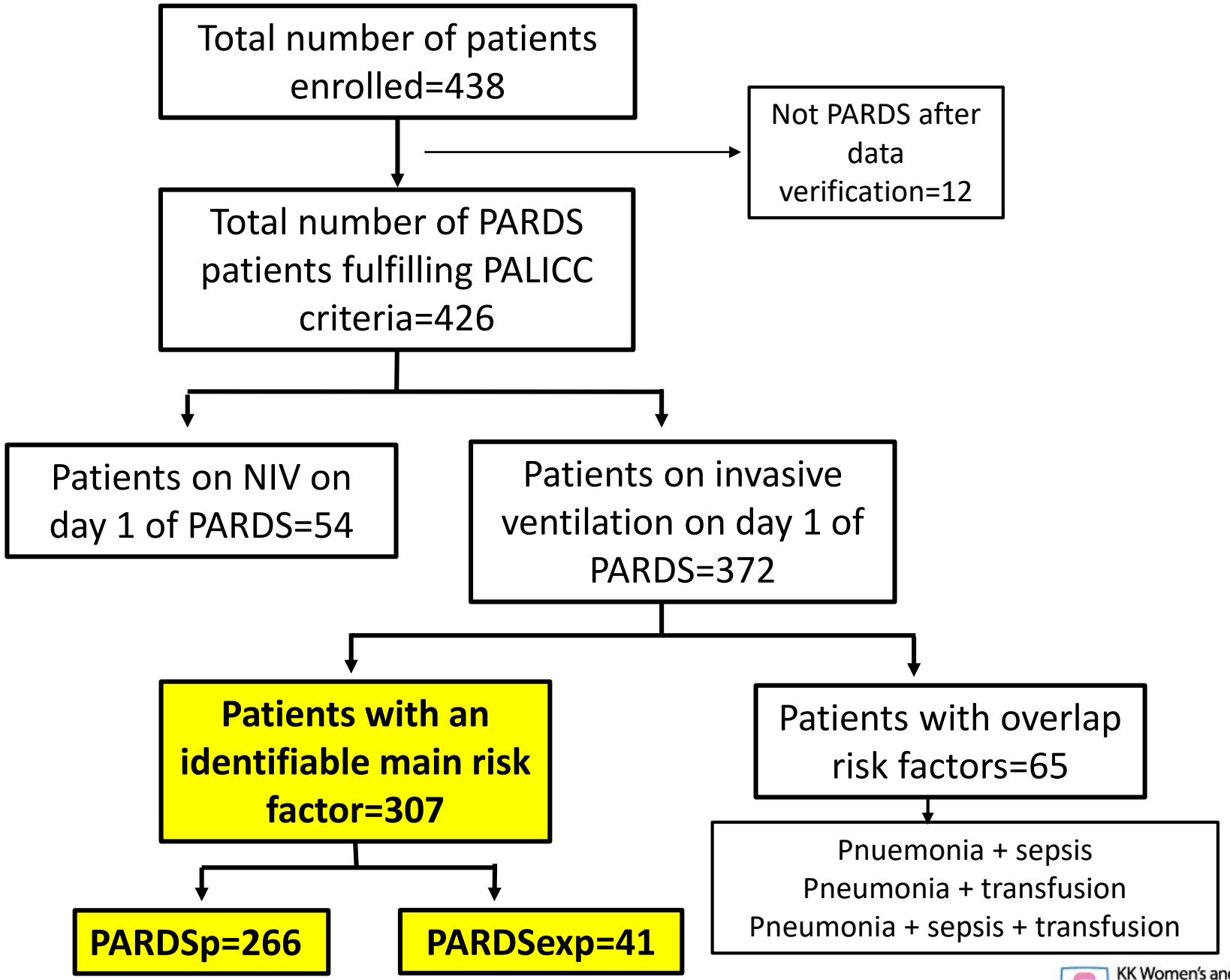
Secondary Studies

Outcomes of Children with Extra-Pulmonary PARDS

High Frequency Oscillatory Ventilation



Gan CS et al. *Ped Crit Care Med 2018*

Classification of PARDS

PARDSp (N = 266), n (%)		PARDSexp (N = 41), n (%)	
Pneumonia	244 (92)	Non-pulmonary sepsis	35 (81)
Aspiration	8 (3)	Trauma	4 (9)
Drowning/near drowning	14 (5)	Transfusion	0 (0)
		Others	4 (9)

Gan CS et al. *Ped Crit Care Med* 2018

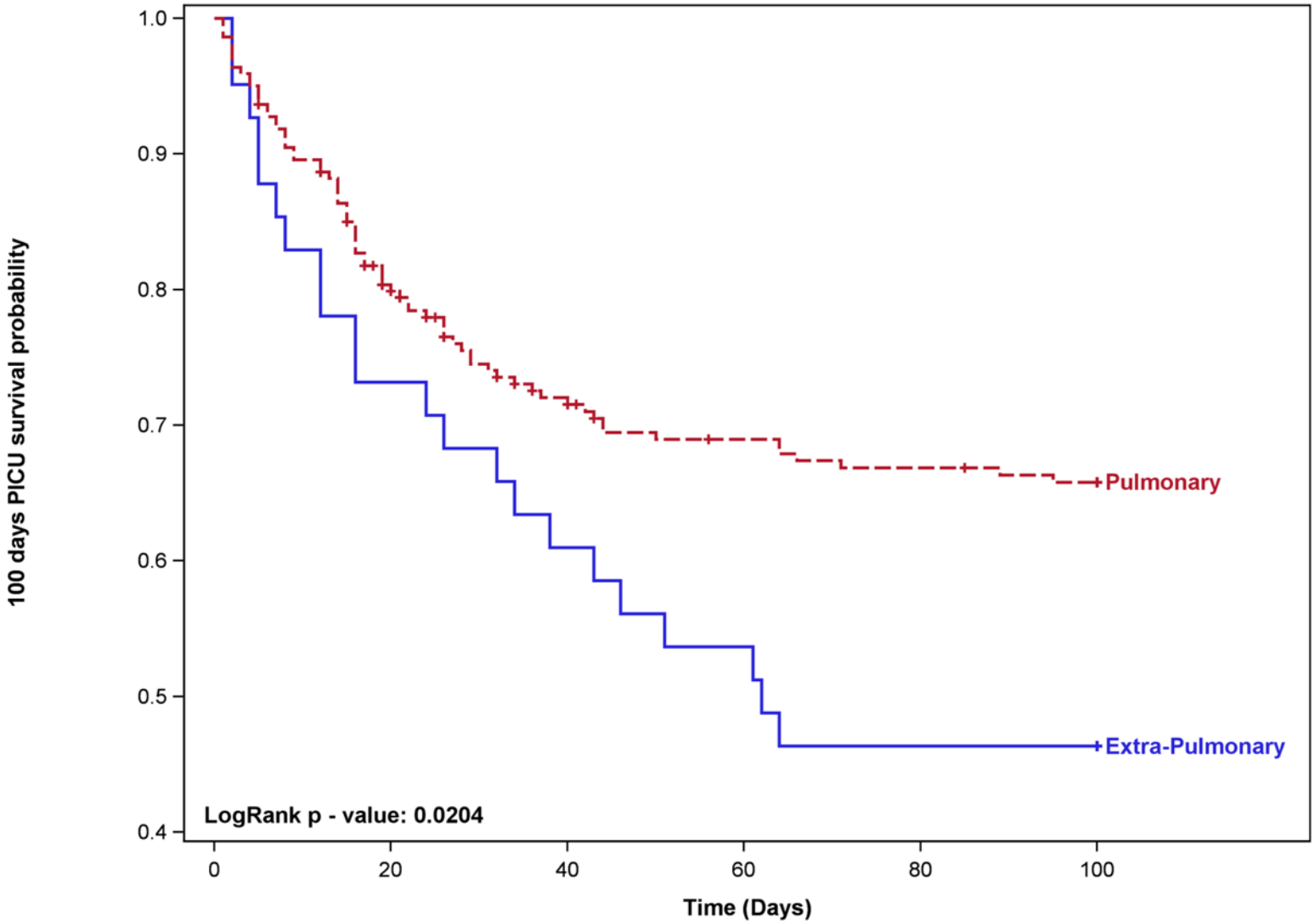
Characteristics	PARDSp (n=266)	PARDSExp (n=41)	P value
Age	1.1 (0.4, 3.6)	2.6 (0.5, 6.6)	0.027
Gender	146 (53.7)	24 (55.8)	0.794
Weight	8.4 (5.4, 15.0)	13.3 (6.5, 20.0)	0.037
Co-morbidities	134 (49.3)	26 (60.5)	0.172
Bacteremia	23 (8.5)	23 (53.5)	< 0.001
PIM 2 score	6.6 (2.9, 14.1)	19.3 (6.6, 43.0)	< 0.001
PELOD score	10 (1, 12)	12 (3, 22)	< 0.001
PF Ratio	126.7 (86.7, 180.0)	103.8 (65.6, 180.9)	0.079
OI	11.3 (7.2, 17.7)	15.1 (8.6, 25.1)	0.101
Multiorgan dysfunction	73 (26.8)	31 (72.1)	< 0.001
Cardiovascular	54 (19.9)	26 (60.5)	< 0.001
Neurologic	21 (07.7)	3 (07.0)	0.864
Hematologic	38 (14.0)	26 (60.5)	< 0.001
Renal	34 (12.5)	15 (34.9)	0.002
Hepatic	35 (12.9)	19 (44.2)	< 0.001

Gan CS et al. *Ped Crit Care Med* 2018

Outcomes

Outcomes	PARDSp (n=266)	PARDSExp (n=41)	P value
PICU Mortality	66 (24.3)	20 (46.5)	0.002
100-day mortality	72 (32.6)	22 (53.7)	0.01
Ventilator free days	19.0 (0.5, 24.0)	2.0 (0.0, 18.0)	0.001
Ventilator Duration	8.0 (4.0, 15.0)	10.0 (4.0, 17.0)	0.295
PICU Duration	11.0 (6.0, 19.0)	12.0 (6 to 29)	0.318
PICU free days	16 (1 to 22)	10 (0 to 21)	0.069

Gan CS et al. *Ped Crit Care Med* 2018



Gan CS et al. *Ped Crit Care Med* 2018

Cox Regression

Covariates	Unadjusted HR (95%CI)	p value	Adjusted HR (95%CI)	p value
PIM 2 score	1.02 (1.01 - 1.02)	< 0.001	1.03 (1.02 - 1.03)	< 0.001
Comorbidities	1.76 (1.15 - 2.68)	0.009	2.57 (1.59 - 4.14)	< 0.001
Multiorgan Dysfunction	3.28 (2.17 - 4.95)	< 0.001	3.33 (1.97 - 5.63)	< 0.001
PARDSExp (Ref: PARDSp)	1.74 (1.08 - 2.81)	0.023	1.69 (0.97 - 2.94)	0.063
PARDS Severity (Ref: Mild)				
Moderate	1.80 (0.96 - 3.39)	0.068	1.50 (0.78 - 2.87)	0.223
Severe	3.48 (1.87 - 6.46)	< 0.001	2.64 (1.29 - 5.38)	0.008

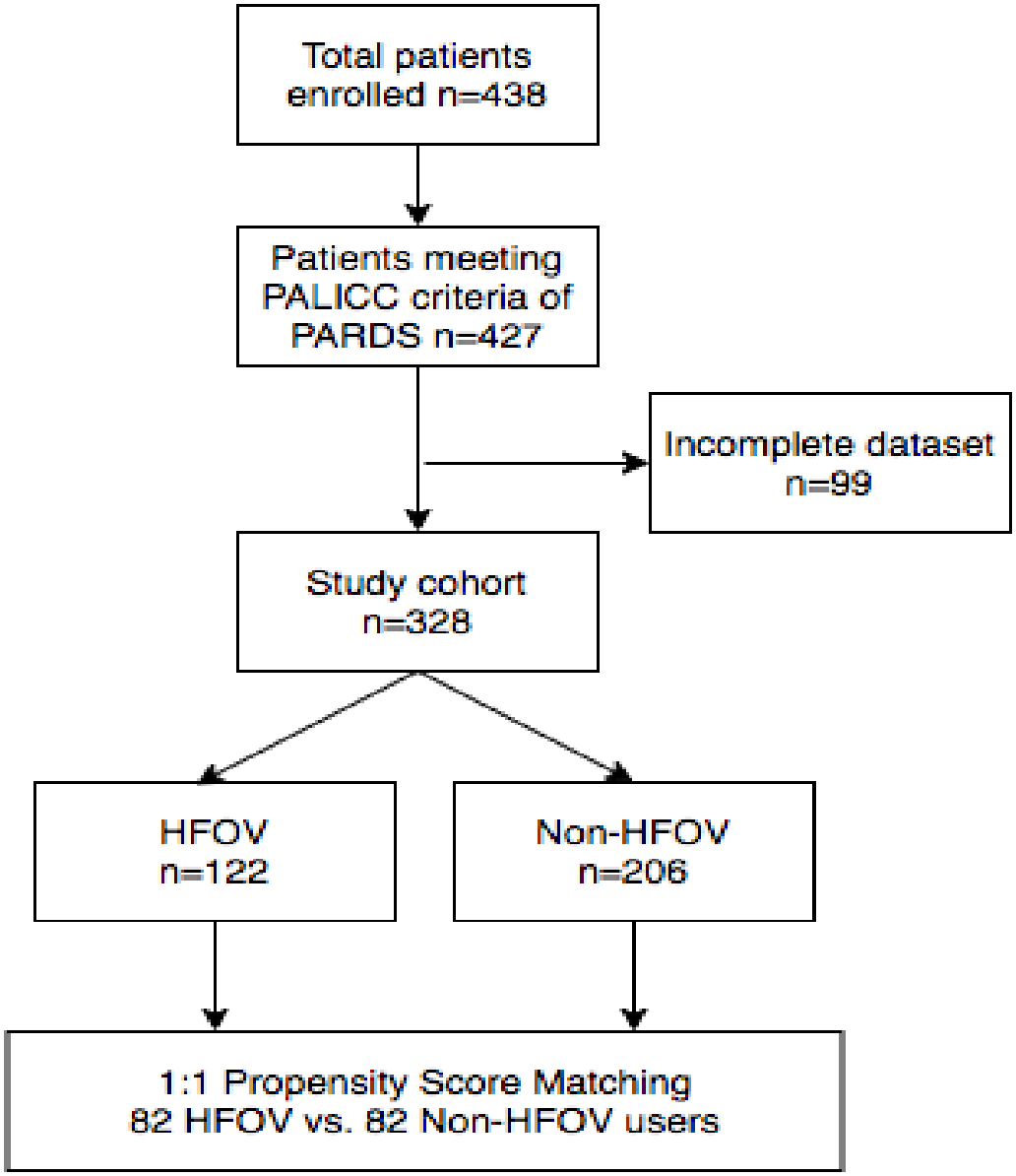
Adjusted for site

Gan CS et al. *Ped Crit Care Med* 2018

Secondary Studies

Outcomes of Children with Extra-Pulmonary PARDS

High Frequency Oscillatory Ventilation



Wong et al. *Presented at WFPICCS 2018*

Demographics	Pre-Matching (N=328)			After Matching with Propensity Score (N=164)		
	Non-HFOV n=206	HFOV n=122	P-value	Non-HFOV n=82	HFOV n=82	P-value
Female gender	44 (0.5)	54 (0.5)	0.083	48 (0.5)	45 (0.5)	0.756
Age, years	4.1 (4.8)	3.9 (4.4)	0.901	3.9 (4.53)	4.3 (4.8)	0.527
PIM2 scores	15.5 (20.7)	19.4 (23.3)	0.121	17.7 (21.49)	16.6 (17.9)	0.723
PELOD scores	9.4 (10.2)	10.8 (9.9)	0.238	10.8 (10.1)	10.8 (9.7)	0.962
Bacteraemia	16 (0.4)	18 (0.4)	0.557	17 (0.4)	18 (0.4)	0.839
Multi-organ dysfunction	40 (0.5)	46 (0.5)	0.281	49 (0.5)	46 (0.5)	0.756
Comorbidities	45 (0.5)	57 (0.5)	0.046	54 (0.5)	55 (0.5)	0.876
Risk factors						
Pneumonia	80 (0.4)	86 (0.4)	0.142	82 (0.4)	83 (0.4)	0.839
Sepsis	30 (0.5)	27 (0.5)	0.621	32 (0.5)	32 (0.5)	1.000
Aspiration	5 (0.22)	3 (0.2)	0.497	4 (0.2)	4 (0.2)	1.000
Transfusion	1 (0.1)	2 (0.2)	0.289	1 (0.1)	1 (0.1)	1.000
Drowning	4 (0.2)	2 (0.2)	0.375	4 (0.2)	2 (0.2)	0.652
Oxygenation index (OI)			<0.001			0.809
Mild (4≤OI<8)	85 (41.3)	10 (8.2)		9 (11.0)	10 (12.2)	
Moderate (8≤OI<16)	58 (28.2)	35 (28.7)		33 (40.2)	27 (32.9)	
Severe (OI≥16)	39 (18.9)	74 (60.7)		37 (45.1)	42 (51.2)	

Continuous variables summarized as mean (SD)
Categorical variables summarized as percentages (SD)

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Propensity Score Model

	Odds Ratio	95% CI		P-value
Female	1.48	0.85	2.58	0.17
Age(year)	0.99	0.93	1.05	0.80
PIM2%	1.01	0.99	1.02	0.53
PELOD	1.03	0.99	1.06	0.12
Bacteremia	1.54	0.69	3.41	0.29
MODS	0.82	0.45	1.51	0.53
Comorbidity	1.10	0.62	1.94	0.75
Risk Factor for ARDS				
Pneumonia	1.66	0.69	3.99	0.25
Sepsis	0.48	0.24	0.99	0.05
Aspiration	0.94	0.24	3.66	0.93
Transfusion	9.93	1.07	92.05	0.04
Drowning	0.87	0.13	5.66	0.88
Oxygenation index (OI)*				
Moderate (8≤OI<16)	6.06	2.75	14.44	<0.001
Severe (OI≥16)	21.02	9.55	50.84	<0.001

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Clinical Outcomes

	Non-HFOV (n=82)	HFOV (n=82)	p-value	Odds Ratio (95 %CI)
PICU mortality, n (%)*	29 (35.36)	32 (39.02)	0.72	1.21 (0.56, 2.66)
100-day mortality, n (%)*	52 (63.41)	44 (53.66)	0.46	0.71 (0.31, 1.57)
	Non-HFOV (n=82)	**HFOV (n=82)**	**p-value**	**Mean Difference (95 %CI)**
VFD, mean (SD)+	10.2(9.8)	8.3(8.8)	0.16	-3.00 (-7.00, 1.00)
IFD, mean (SD)+	8.2(8.8)	5.7(7.7)	0.052	-3.50 (-8.00, 0.00)

*McNemar's test
+Wilcoxon Signed Rank test
IFD: 28-day PICU-free days; VFD: 28-day ventilator-free days

Wong et al. *Presented at WFPICCS 2018*

Overview

- Establishing the need for Pediatric Acute & Critical Care Medicine Asian Network (PACCMAN)
- History of PACCMAN
- Epidemiology of PARDS in Asia
- Future Directions/Conclusion

Current PACCMAN Sites

- KK Women's and Children's Hospital, Singapore
- National University Hospital, Singapore
- National Children's Hospital, Vietnam
- Siriraj Hospital Mahidol University, Thailand
- King Chulalongkorn Memorial Hospital, Thailand
- Ramathibodi Hospital, Thailand
- Sarawak General Hospital, Malaysia
- Hospital Selayang, Malaysia
- Universiti Malaysia Medical Centre, Malaysia
- Institute of Paediatrics, Hospital Kuala Lumpur, Malaysia

- Beijing Children's Hospital, China
- Children's Hospital of Chongqing Medical University, China
- Prince of Wales Hospital, Hong Kong
- Queen Mary Hospital, Hong Kong
- Chinese University of Hong Kong, Hong Kong
- Yankin Children's Hospital, Myanmar
- Vicente Sotto Memorial Medical Center, Philippines
- Tokyo Metropolitan Children's Medical Centre, Japan
- Kobe Children's Hospital, Japan

Challenges within PACCMAN

- Different national healthcare systems
- Site heterogeneity
  - Resources
  - Clinical capabilities
- Focused on clinical services
- Research infrastructure not well established
- Language
- Funding

Let's Form a PACT!!

PACCMAN ANZICS Collaborative Team

- Engagement with international groups is a **priority** for PACCMAN
- Identify areas of interest
  - PARDS
  - Severe Pneumonia
- Looking internally *vs*. externally
- Mentorship
- Sustainability

Quality Patient Care With Personal Touch

HOSPITAL UMUM SARAWAK

UNIVERSITY OF MALAYA

UM MEDICAL CENTRE

MALAYSIA

Vietnam National Children's Hospital

VIETNAM

KK Women's and Children's Hospital

SingHealth

SINGAPORE CLINICAL RESEARCH INSTITUTE

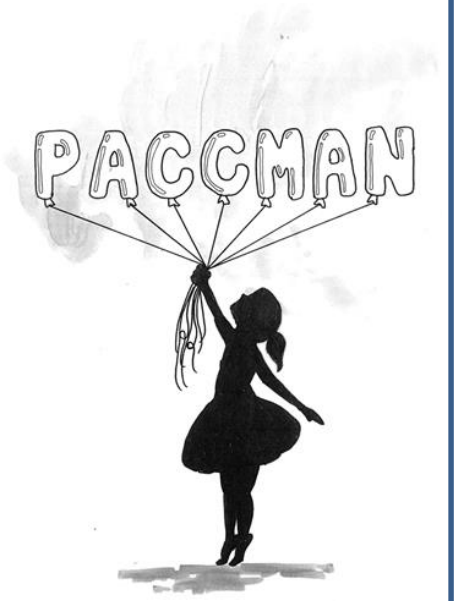
NUH National University Hospital

SINGAPORE

Faculty of Medicine Chulalongkorn University

MAHIDOL UNIVERSITY FACULTY OF MEDICINE SIRIRAJ HOSPITAL

THAILAND



CHCMU Children's Hospital of Chongqing Medical University 重庆医科大学附属儿童医院

首都医科大学附属北京儿童医院

Beijing Children's Hospital, Capital Medical University

CHINA

KK Women's and Children's Hospital SingHealth

ANZICS/ACCCN
Intensive Care ASM
11-13 October 2018
Adelaide Convention Centre

ANZICS ACCCN

KK Women's and Children's Hospital
SingHealth

Thank You

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