Cost-effectiveness analysis of nirsevimab for prevention of respiratory syncytial virus infection in infants and vulnerable children under two years in South Korea

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INTRODUCTION

- The respiratory syncytial virus (RSV) is a prevalent cause of lower respiratory tract infections (LRTIs) in infants and young children[1].
- Currently, RSV prophylaxis is limited to vulnerable infants, while RSV places a substantial burden on the entire infant population, including both vulnerable and healthy infants[2-3].
- Although nirsevimab, a long-acting monoclonal antibody, has demonstrated significant efficacy and safety for preventing RSV-associated LRTIs in infants, regardless of their underlying health conditions or gestational ages[4-6], its cost-effectiveness remains unclear to date.

OBJECTIVE

- **To evaluate the cost-effectiveness of nirsevimab compared with the standard of care (SoC) in South Korea.**
- **To analyze the cost-effective price threshold of nirsevimab in South Korea for the seasonal prevention strategy targeting all infants and palivizumab-eligible children under 2 years old.**

METHODS

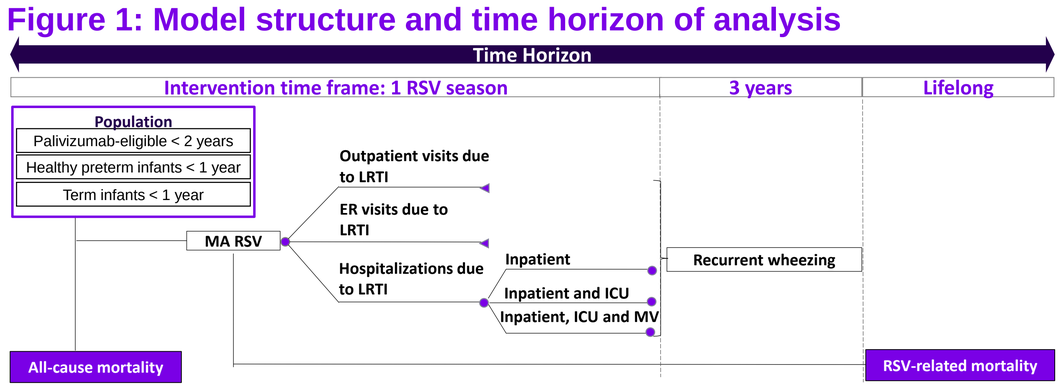
Model structure, population, and treatment strategies

- A month-age-specific static decision-tree model was used with a birth cohort born in 2023 (n=236,720).
- The cohort subgroups were categorized into palivizumab-eligible children under 2 years (1.75%), healthy preterm infants (7.8%), and term infants (90.45%).
- Nirsevimab, administered as a single dose, was compared with the standard of care: monthly palivizumab dosing (up to five doses) for the palivizumab-eligible population during the RSV season and no prophylaxis for healthy preterm and term infants.

Sensitivity analysis

- One-way deterministic sensitivity analysis (DSA) and probabilistic sensitivity analysis (PSA) were conducted to evaluate the model uncertainties.

Figure 1: Model structure and time horizon of analysis



Abbreviations: ER = emergency room; ICU = intensive care unit; LRTI = lower respiratory tract infection; MA = medically attended; MV = mechanical ventilation; PC = primary care; RSV = respiratory syncytial virus

Table 1: Key efficacy and epidemiology parameters

Parameters	Population		
	Palivizumab -eligible	Health Preterm	Term
Nirsevimab efficacy			
Inpatient prevention, %	51.00%	83.21%	83.21%
Outpatient prevention, %	51.00%	86.20%	74.50%
Palivizumab efficacy			
Inpatient prevention, %	51.00%	N/A	N/A
Outpatient prevention, %	51.00%	N/A	N/A
RSV infection seasonality distribution, %			
October		8.43%	
November		10.59%	
December		27.84%	
January		34.55%	
February		14.53%	
March		4.06%	
Risk of complication due to RSV			
	1st Year	2nd Year	3rd Year
Recurrent wheezing	24.52%	13.99%	9.80%

Table 2: Utility and mortality parameters

Parameters	Values
Coverage rate, %	94%
QALY losses	
Inpatient hospitalization	0.0102
Outpatient/ER visit	0.0063
Caregiver	0.0031
Complication due to RSV	$0.0392_{(1st\ yr)}$/$0.0375_{(2nd\ yr)}$/$0.0359_{(3rd\ yr)}$
All-cause mortality	
0-5 months old	0.0005
6-11 months old	0.0001
12-24 months old	0.0001
RSV-related mortality	
0-5 months old	0.000006
6-11 months old	0.000001
12-24 months old	0.000002

Table 3: Direct and indirect costs (USD in 2023)

Parameters	Population		
	Palivizumab -eligible	Health Preterm	Term
Cost of prophylaxis			
Palivizumab	$ 706	-	-
Treatment cost of RSV			
Hospitalization	$ 1,193	$ 992	$ 845
ICU inpatient	$ 5,721	$ 3,826	$ 3,650
MV inpatient	$ 43,235	$ 16,622	$ 12,535
Outpatient	$ 669	$ 57	$ 43
ER visit	$ 150	$ 160	$ 154
Cost of complication			
Recurrent wheezing (1st yr)	$ 1,296	$ 451	$ 315
Recurrent wheezing (2nd yr)	$ 404	$ 410	$ 254
Recurrent wheezing (3rd yr)	$ 653	$ 234	$ 177
Indirect cost by health status			
Hospitalization, ICU, MV		$ 630	
Outpatient, ER		$ 400	
Cost of infant mortality		$ 93,194	

Abbreviations: QALY, Quality adjusted life year; ER, emergency room; ICU, intensive care unit; MV, mechanical ventilation; USD, United States dollars.

RESULTS

- The maximum cost-effective price of nirsevimab was $446 at a 1 gross domestic product (GDP) per capita willingness-to-pay (WTP) threshold and $525 at a 1.5 GDP per capita WTP threshold per quality-adjusted life year (QALY) gain.
- The incremental cost-effectiveness ratio (ICER) calculated at the maximum cost-effective price of nirsevimab at 1 GDP, which is $446, amounted to $33,139/QALY. Subgroup and sensitivity analysis with these prices showed that the uncertainty was mainly linked to epidemiological and population parameters.

Table 3: Health event avoided and QALYs gained

Health Outcomes		Population Total	Subpopulations		
			Palivizumab-eligible	Health Preterm	Term
Total number of:	*Hospitalizations*	-28,340	-91	-2,243	-26,006
	ICU	-1,888	-2	-150	-1,736
	Mechanical ventilation	-527	-1	-42	-484
	Outpatient	-6,124	-25	-553	-5,546
	ER visits	-221	-1	-20	-200
	Inpatient deaths	-1	0	0	0
Total QALYs Saves		1,085.90	3.62	88.04	994.25

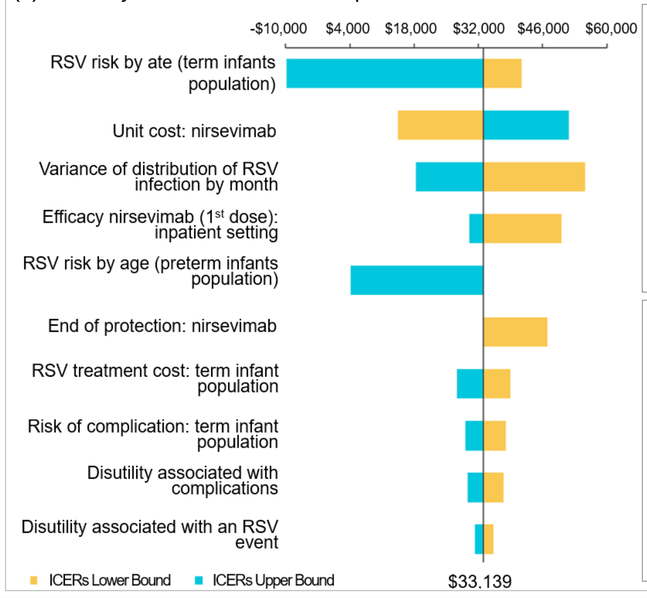
Table 4: ICERs analysis by willingness-to-pay threshold and population

WTP threshold	Maximum Cost-effective price	Items	Population Total	Subpopulations		
				Palivizumab-eligible	Health Preterm	Term
1.0 GDP per capita	***$446***	*Incremental QALYs gained*	1,085.9	3.6	88.0	994.2
		Incremental costs	$35,985,474	- $1,825,508	$2,339,229	$35,471,753
		ICERs	***$33,139***	Dominant	$26,571	$35,677
1.5 GDP per capita	***$525***	*Incremental QALYs gained*	1,085.9	3.6	88.0	994.2
		Incremental costs	$53,890,912	-$1,189,595	$3,710,235	$51,370,271
		ICERs	***$49,628***	Dominant	$42,144	$51,667

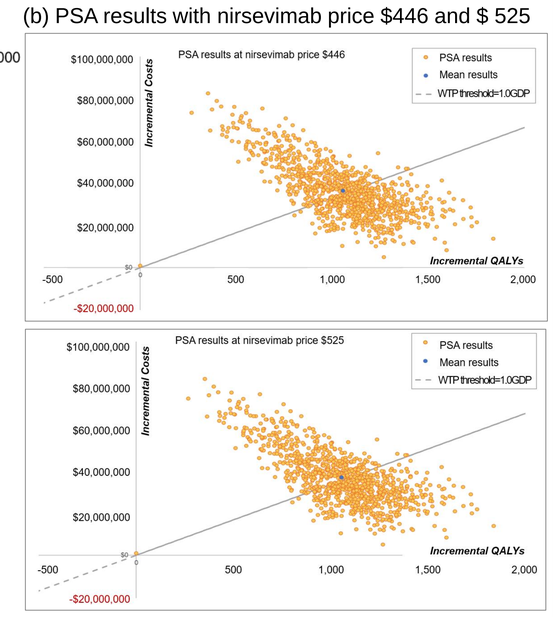
- DSA identified RSV epidemiology, treatment efficacy, and price as key drivers of ICER variations.
- PSA showed that nirsevimab was cost-effective at $446 in 54% of the simulations at a 1 GDP threshold and 79% at a 1.5 GDP threshold.

Figure 2: Sensitivity analysis results

(a) One-way DSA results with the top 10 influential variables



(b) PSA results with nirsevimab price $446 and $ 525



CONCLUSIONS

- **Nirsevimab appeared to be a cost-effective intervention for preventing RSV-associated lower respiratory tract infections in a seasonal immunization program for all infants and palivizumab-eligible children <2 years in South Korea.**
- **This demonstrates substantial health benefits with nirsevimab compared with the current standard of care associated with significant economic savings for RSV prevention.**

REFERENCES

1.Nduaguba SO, Tran PT, Choi Y, Winterstein AG. Respiratory syncytial virus reinfections among infants and young children in the United States, 2011-2019. PLoS One 2023; 18(2): e0281555. 2.Dawson-Caswell M, Muncie Jr HL. Respiratory syncytial virus infection in children. American family physician 2011; 83(2): 141-6. **3.**Smithgall M, Maykowski P, Zachariah P, et al. Epidemiology, clinical features, and resource utilization associated with respiratory syncytial virus in the community and hospital. Influenza and other respiratory viruses 2020; 14(3): 247-56. 4. Hammitt LL, Dagan R, Yuan Y, et al. Nirsevimab for prevention of RSV in healthy late-preterm and term infants. New England Journal of Medicine 2022; 386(9): 837-46. 5. Simões EA, Madhi SA, Muller WJ, et al. Efficacy of nirsevimab against respiratory syncytial virus lower respiratory tract infections in preterm and term infants, and pharmacokinetic extrapolation to infants with congenital heart disease and chronic lung disease: a pooled analysis of randomised controlled trials. The Lancet Child & Adolescent Health 2023; 7(3): 180-9. 6. Domachowske J, Madhi SA, Simões EA, et al. Safety of nirsevimab for RSV in infants with heart or lung disease or prematurity. New England Journal of Medicine 2022; 386(9): 892-4.fants and young children in the United States, 2011-2019. PLoS One 2023; 18(2): e0281555.

CONFLICTS OF INTEREST

Eun Jin Bae and Samira Soudani are Sanofi employees and may hold stock options. All other authors have indicted no potential conflicts of interest to disclose.

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