Study on the Value Pricing of COVID-19 Vaccine in China Based on the Evidence of Cost-Effectiveness Analysis

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Objective

- To provide evidence for medical pricing of COVID-19 vaccination by analyzing the cost-effectiveness of different types of COVID-19 vaccines (namely, inactivated, adenovirus, recombinant protein, and mRNA vaccines) using the evidence from random clinical trials and real-world evidence.

Methods

- The efficacy and effectiveness data of four different kinds of COVID-19 vaccines was data driven from RCT or meta-analyses, and the cost of vaccine per dose was calculated using medical insurance purchasing price of inactivated vaccine and other data collected from real-world. Then the cost-effectiveness of the whole inoculation of four COVID-19 vaccines was examined and incremental cost-effectiveness ratio (ICER) of a whole vaccination inoculation in avoiding COVID-19 related infection, hospitalization, ICU admission, and death was calculated respectively.

- By setting the most cost-effective vaccine as the comparator, the prices of other three vaccines were adjusted to reach an equal ICER with the comparator, in avoiding infection, hospitalization, ICU admission, and death.

- Finally, median price in avoiding infection, hospitalization, ICU admission, and death was generated, and the price of whole vaccination inoculation was calculated correspondingly.

Results

- When medical insurance purchasing price of inactivated vaccine per dose was at $2.97 (US$1 = ￥6.737), the cost of a whole inoculation should be capped at $9.25, including vaccine cost, transportation cost, storage cost and injection fee; therefore, the net price per dose of inactivated, adenovirus, recombinant protein, and mRNA vaccines were $2.79, $7.14, $1.34, and $2.60, respectively.

- Regardless of the type of vaccine, providing basic immune vaccination was cost-saving, and among them, mRNA vaccine was the most cost-saving strategy.

- Under the comprehensive consideration of the effects in avoiding COVID-19 related infection, hospitalization, ICU admission, and death, price of vaccine per dose was adjusted based the equivalent ICER. The price of basic immune procedure of four kinds of vaccines should be reduced to $7.84, $7.26, $7.92 and $9.25, and the price per dose should be $2.13, $5.27, $0.92, and $2.60, respectively.

Conclusion

- COVID-19 vaccines are cost-saving in preventing COVID-19 related infection, hospitalization, ICU admission, and avoiding death from a societal perspective, regardless of the type.

- Medical insurance reimbursement price of COVID-19 vaccines can be set and adjusted based on economic evaluation using RCT and real-world effectiveness evidence.

Table 1 Cost per dose of different vaccine at equivalent immune procedure cost

Type of vaccine	Cost of a basic immune procedure ($)	Cold-chain freight fee per dose ($)	Administration cost per dose ($)	Immunization schedule (Doses)	Transportation cost per dose ($)	Price per dose ($)
Inactivated vaccine	9.25	0.17	1.48	2	0.18	2.79
Adenovirus vectored vaccine	9.25	0.17	1.48	1	0.45	7.14
Protein subunit vaccine	9.25	0.17	1.48	3	0.09	1.34
mRNA vaccine	9.25	0.38	1.48	2	0.17	2.60

Table 2 Price adjustment results of four types of vaccine

	Type of vaccine	Adjusted ICER ($/Case)	Adjusted cost of basic immune procedure($)	Cost ratio per basic immune procedure	Cost per dose after adjust ($)	Price reduction per dose
Against infection	Inactivated vaccine	-3652.52	6.61	1.13	1.55	44.60%
	Adenovirus vectored vaccine	-3652.52	5.83	1.00	3.92	45.09%
	Protein subunit vaccine	-3652.52	7.68	1.42	0.85	36.71%
	mRNA vaccine	-3652.52	9.25	2.00	2.60	/
Against hospitalization	Inactivated vaccine	-12096.04	7.50	1.00	1.97	29.55%
	Adenovirus vectored vaccine	-12096.04	8.69	1.16	6.61	7.37%
	Protein subunit vaccine	-12096.04	8.30	1.17	1.04	22.14%
	mRNA vaccine	-12096.04	9.25	1.23	2.60	/
Against ICU	Inactivated vaccine	-22209.29	9.25	1.57	2.79	0.00%
	Adenovirus vectored vaccine	-	-	-	-	-
	Protein subunit vaccine	-22209.29	5.54	1.00	0.18	86.68%
	mRNA vaccine	-22209.29	9.25	1.57	2.60	/
Against death	Inactivated vaccine	-17799.02	8.18	1.00	2.28	18.15%
	Adenovirus vectored vaccine	-	-	-	-	-
	Protein subunit vaccine	-17799.02	8.16	1.00	1.00	25.57%
	mRNA vaccine	-17799.02	9.25	1.13	2.60	/

Table 3 Median price of basic immune procedure and of a single dose of four types of vaccine

Type of vaccine	Adjusted cost of basic immune procedure($)	Cost per dose after adjust($)	Price reduction per dose
Inactivated vaccine	7.84	2.13	23.85%
Adenovirus vectored vaccine	7.26	5.27	26.23%
Protein subunit vaccine	7.92	0.92	31.14%
mRNA vaccine	9.25	2.60	/