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Twin Vaginal Deliveries in Labor Rooms: A Cost-Effectiveness Analysis

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Background/ Objective

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- In many institutions, twin vaginal deliveries (VDs) occur in the operating room (OR) given the risk of converting to cesarean delivery (CD) for twin B.
- Overall the risk of conversion is low around 7%, and more data is needed to investigate the cost-effectiveness of delivering twins in the labor and delivery room (LDR) versus the OR.
- We aimed to evaluate the cost-effectiveness of performing VDs for twin gestations in the LDR versus the OR.

Study Design

Study Design

- We designed a decision-analysis model to compare costs and effectiveness of two strategies of twin deliveries undergoing trial of labor:
    1. Intended delivery in the LDR
    2. Delivery in the OR
- We included costs associated with each combination of VD and CD adjusted for January 2019 USD.
- One-way, two-way, and Monte Carlo sensitivity analyses were performed to assess model strength.
- Incremental cost effectiveness ratio (ICER) was defined as cost needed to gain one quality adjusted life year (QALY).
- Tree Age Pro was used for analysis.

Results

Results

- In the base case scenario, where 7% of deliveries resulted in conversion to CD for twin B, attempting to deliver twins in the LDR is the most cost-effective strategy.
- For every QALY gained by delivering in the OR, 243,335 USD would need to be spent (ICER).

Results

- In univariate sensitivity analyses, the most cost-effective strategy shifted to delivering in the OR when the following was true:
  1. Probability of successful VD was less than 86%
  2. Probability of morbidity after emergent CD from the LDR exceeded 3.5%
  3. Cost of VD in the LDR exceeded 10,500 USD
  4. Cost of CD in the OR was less than 10,000 USD or
  5. Probability of death from emergent CD exceeded 2.8%
- In bivariate analyses, the most cost-effective strategy was sensitive to:
  1. Cost of VD in the OR versus LDR
  2. Probability of VD in the LDR combined with cost of conversion
  3. Probability of morbidity after emergent CD combined with cost of neonatal morbidity
- Assuming a willingness-to-pay of 100,000 USD per neonatal QALY gained, attempted vaginal delivery in the LDR was cost-effective in 51% of simulations in a Monte Carlo analysis.

Table 1: Model Inputs

Input	Base-Case (%)	Range (%)	References
Labor Probabilities			
Induction of labor	48	20-50	1-3
CD prior to second stage in induction of labor	25	12-61	4,5
CD prior to second stage in spontaneous labor	10	9-24	4,5
VD of both twins	93	75-99	4,5
Neonatal Outcome Probabilities			
NICU admission	62	17-78	6.7
NICU admission if delivered by emergent CD	77	55-82	7.8
Neonatal morbidity for a VD or a converted CD	1	0-1.7	9,10
Neonatal morbidity if delivered by emergent CD	2	1-6	11-13
Fetal/neonatal death	1.7	0.8-3.4	3.10
QALY for neonate with severe morbidity*	0.75	0.6-0.96	14,15
Average life expectancy	79	76-81	16,17
Discount rate	0.03	0-0.06	--
Cost (USD)			
Cesarean delivery	12897	6448-25794	18
VD in an LDR	7937	3968-15874	18
VD in LDR and emergent CD in OR	10417	5208-20834	18
VD in OR	12521	6260-25042	18
VD and CD in OR	12709	6354-25418	18
NICU admission	43254	21627-25418	18
Nursery care	1234	617-2468	18
Lifetime cost of severe neonatal morbidity	1490745	750000-3000000	19,20

Table 2: Outcomes Based on Strategy (per 1000 women)

	Delivery in the LDR	Delivery in the OR
Total Cost (USD)	$52,357,070	$54,790,420
Total neonatal QALYs	30,680	30,690
Incremental cost per QALY	--	$243,335
NICU admissions	629	620
Neonates with morbid conditions*	11	10

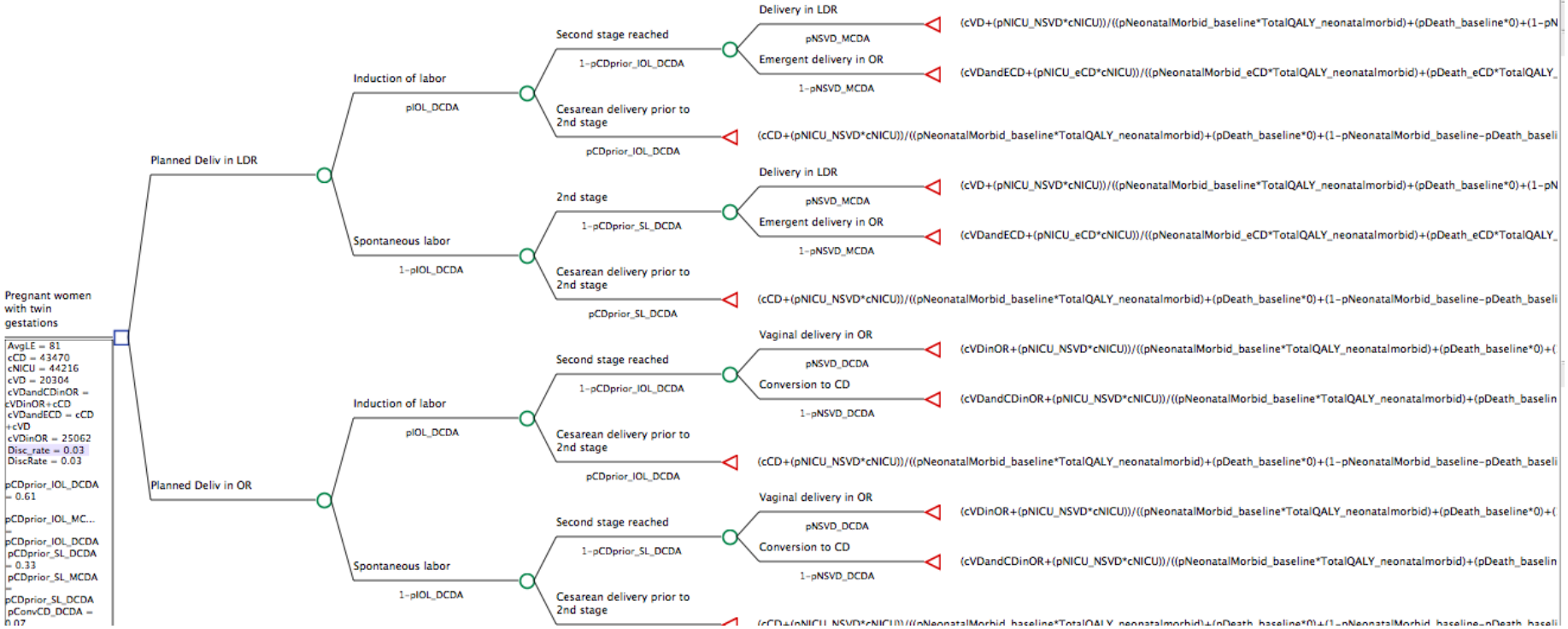
**Morbid conditions was defined as the presence or development of hypoxic ischemic encephalopathy, seizures, or cerebral palsy*
CD= cesarean delivery; VD= vaginal delivery; QALY = Quality adjusted life year; NICU = neonatal ICU; LDR = Labor and delivery room; OR = operating room

Conclusion

Conclusion

- Twin VDs in the LDR are cost-effective based on current neonatal outcome data.
- Further investigation is needed to elucidate the impact of cost and outcomes on optimal utilization of resources.

Supplementary Table: Cost Effectiveness Model



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