

Association of mode of ventilation and chest radiography in a large US cohort of preterm infants

MT28

Rituparna Basu<sup>1</sup>, Dominique Brandt<sup>2</sup>, Chien Hung-Iun<sup>1</sup>, Deepak Jain<sup>3</sup>

<sup>1</sup>HEOR, Medical Surgical Portfolio, Medtronic <sup>2</sup>Clinical Research and Medical Science, Respiratory Interventions, Medtronic <sup>3</sup>Rutgers

INTRODUCTION

- Preterm infants are exposed to frequent chest radiography.<sup>1</sup> While required for clinical decision making, significant cumulative exposure to radiation could have long-term implications.

OBJECTIVES

- To investigate the association between mode of ventilation and number of chest radiographs performed during neonatal intensive care unit (NICU) stay in infants with respiratory support.

METHODS

- Data source:** The 2019-2021 Premier™Inc (PINC AI™) hospital-based, all-payer service-level database representing more than 1000 hospitals in the U.S was used for analysis.<sup>2</sup>
- Population:** Preterm liveborn infants of ≤ 36 weeks gestational age (GA) were stratified by GA and ventilation status: invasive mechanical ventilation only (IMV), non-invasive only (NIV), IMV-then-NIV and NIV-then-IMV.
- Outcomes:** Number of chest radiographs, length of stay (LOS) and costs of chest radiograph were compared by GA strata and ventilation status. Other outcomes include duration on ventilator, survival, NICU LOS and discharge status.
- Statistical methods:** The association of number of chest radiographs with GA, ventilation mode, time on respiratory support, and NICU LOS was estimated with the Zero Inflated Negative Binomial model.

RESULTS

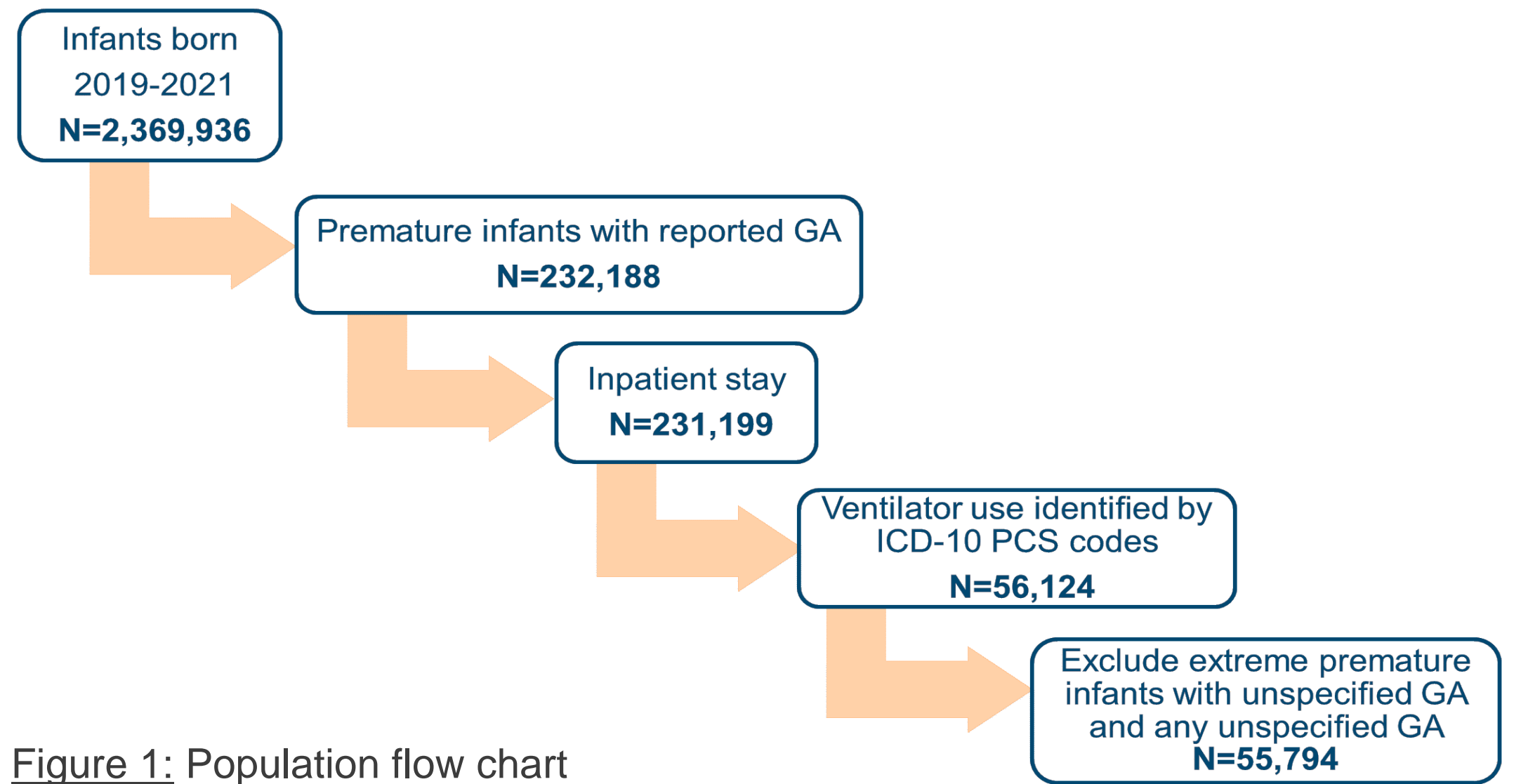


Figure 1: Population flow chart

RESULTS

Figure 2: Average number of chest radiographs of pre-term infants by ventilation type and gestational age

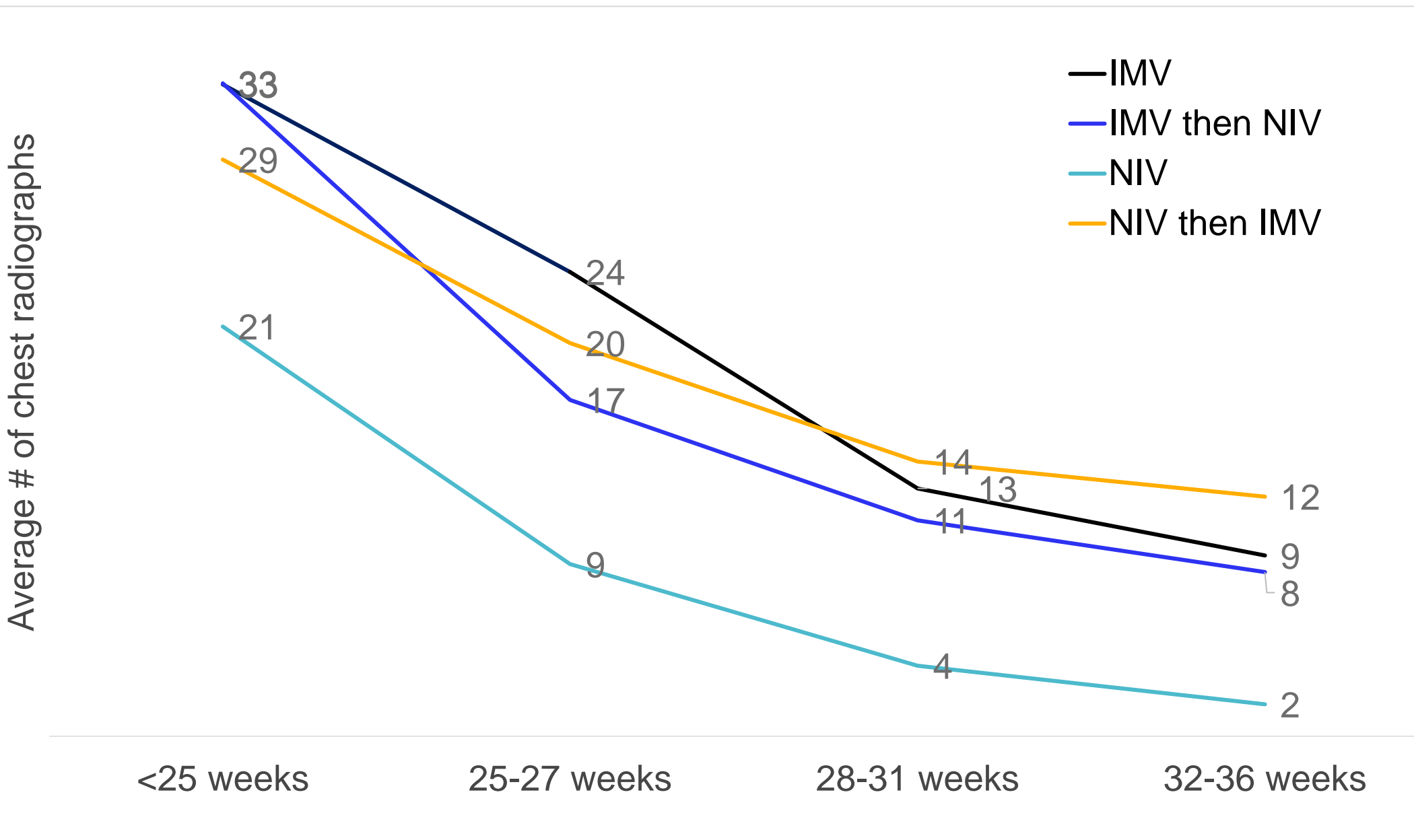


Table 1: Mean(SD) costs of chest radiography by ventilation type and gestational age (2021 USD)

Respiratory Support	<25 weeks	25-27 weeks	28-31 weeks	32-36 weeks
IMV	\$2,394 (2,555)	\$1,748 (1,978)	\$931 (1,421)	\$665 (1,250)
IMV-then-NIV	\$2,678 (2,463)	\$1,365 (1,398)	\$898 (1,052)	\$651 (833)
NIV	\$2,072 (3,613)	\$739 (1,124)	\$308 (496)	\$159 (224)
NIV-then-IMV	\$2,087 (2,101)	\$1,431 (1,270)	\$1,074 (1,130)	\$917 (1,232)

Table 2: Average LOS of pre-term babies by ventilation type and gestational age of those who survived

Respiratory Support	<25 weeks	25-27 weeks	28-31 weeks	32-36 weeks
IMV	108 (60)	92 (41)	60 (35)	29 (34)
IMV-then-NIV	122 (42)	95 (31)	64 (28)	31 (28)
NIV	89 (72)	74 (35)	45 (23)	16 (13)
NIV-then-IMV	114 (39)	96 (41)	68 (34)	35 (33)

RESULTS

- From 2019-2021, 55,794 preterm live born infants met study criteria (Figure1), of which about 5% were born <25 weeks GA 10% between 25 to 27 weeks, 23% between 28-31 weeks, and 62% between 32 and 36 weeks.
- Seventy five percent of premature infants were on NIV which was mostly driven by infants born at 32-36 weeks GA, followed by IMV at 19%, IMV-then- NIV 4%, and NIV-then-IMV 2%.
- As expected, survival rates were the lowest in infants <25 weeks GA (ranging from 69% in the IMV to 98% in the IMV-then-NIV group).
- Figure 1, tables 1 & 2 show that infants born <25 weeks GA had higher chest radiograph exposure, LOS and costs which were significantly higher than other GAs, irrespective of mode of ventilation (P<0.0001). The average LOS was also higher among < 25 weeks GA (ranging from 122 days in IMV-then-NIV to 89 days in the NIV group). Similar trends were observed in NICU LOS. Infants on NIV had lower exposure to chest radiographs and lower stay in the NICU and lowest overall cost of chest radiographs ( P<0.001).
- The model showed a statistically significant and positive association between number of chest radiographs and invasive ventilation, GA, time on ventilator and NICU LOS,P<0.0001. (Not shown)
- The average cost per chest radiograph is estimated at about \$101 (USD 2021).

CONCLUSIONS

- Infants born at the limits of viability have significant higher exposure to chest radiography during their long hospital stay.
- The risk is accentuated by IMV and the switch of mode of ventilation.
- The long-term health impact of these exposure and the strategies to limit them need to be further investigated.

REFERENCES

1. Iyer NP, Baumann A, Rzeszutarski MS, Ferguson RD, Mhanna MJ. Radiation exposure in extremely low birth weight infants during their neonatal intensive care unit stay. World J Pediatr. 2013 May;9(2):175-8. doi: 10.1007/s12519-013-0417-1. Epub 2013 May 16. PMID: 23677834

2. PINC AI™ Healthcare Data White Paper: Data that informs and performs, September 14, 2021. PINC AI™ Applied Sciences, Premier Inc. <https://offers.premierinc.com/rs/381-NBB-525/images/Premier-Healthcare-Database-Whitepaper-Final.pdf>

Medtronic

The study was sponsored by Medtronic. RB, DB, and CHI are full time employees of Medtronic