Medication Use Evaluation of Lung Surfactant in the NICU: Beractant & Poractant Alfa

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BACKGROUND

Respiratory distress syndrome (RDS) poses a significant mortality threat to preterm and term infants who fail to endogenously produce adequate amounts of lung surfactant[1]. Exogenous surfactant replacement therapy serves as a key therapeutic option for neonates with RDS, with studies demonstrating improved clinical outcomes with the use of natural surfactant products over synthetic products[2]. Three natural surfactants are currently available in the United States: poractant alfa (CUROSURF®), beractant (Survanta®), and calfactant (Infasurf®). Notably, the American Academy of Pediatrics does not recommend the use of one surfactant over another based on available clinical data[3]. FDA-approved uses for beractant include RDS prophylaxis and rescue treatment, whereas poractant alfa is only currently approved for RDS rescue treatment[4]. Surfactant products on the institution's formulary currently include beractant and poractant alfa.

Appropriate dosing, as provided in Lexicomp® and the drug monograph, is as follows:

- Beractant: 4 mL/kg (100 mg/4mL)
- Poractant alfa: 3 mL/kg (240mg/3mL) and then 1.25 mL/kg (120mg/1.5mL) thereafter

Beractant and poractant alfa are available in several product sizes which can be used to create a patient-specific dose based on weight. The facility carries two types of surfactants in the following strengths and sizes:

Poractant alfa	**Estimated Cost**
120 mg/ 1.5 mL vial	$430
Beractant	**Estimated Cost**
100 mg/4mL vial	$250
200 mg/8mL vial	$450

Note: Poractant alfa is also available in a 240 mg/ 3mL vial that is not purchased in the facility

PURPOSE

The purpose of this study is to evaluate inventory utilization and dosing appropriateness of beractant and poractant alfa within the facility to identify opportunities relating to drug purchasing, prescribing, and utilization.

METHODS

- This study is a retrospective chart review of neonatal patients treated in the NICU with either beractant or poractant alfa for RDS. The total number of doses administered between May 2019 and April 2020 was extrapolated from electronic medical records and summated. Of the 813 doses administered, we identified 393 unique patients who received either beractant, poractant alfa, and in some instances, both.
- Surfactant replacement order information including surfactant type, prescribed dose, and total number of doses administered were collected. Patient demographics that were collected included the patient location (i.e. NICU), weight, and FIN number.
- Surfactant products were evaluated regarding dosing appropriateness, which was defined as a prescribed dose within ± 10% from the recommending dosing stated in Lexicomp®/drug monograph.
- The inventory utilization of surfactants was evaluated by assessing the cost difference between the actual combination of vials used to create a patient dose and the next best alternative vial combination. If subtracting the cost of the alternative from the actual vial combination yielded a positive value, it represented a cost savings opportunity.
- Observations made on medication dosing and utilization within the facility were reported; tests of statistical significance were not performed in this study.

RESULTS

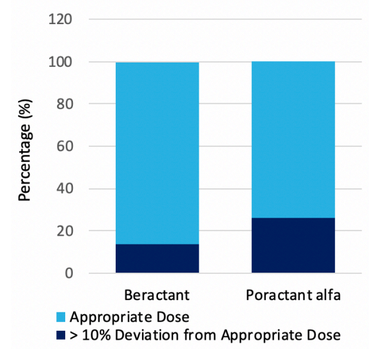
PATIENT CHARACTERISTICS

Table 1: Demographics of Study Population

Demographics	**n (%)**
Location (NICU)	n = 393 (100%)
Weight	
▪ Extremely Low Birth Weight: < 1.0 kg	52 (13%)
▪ Very Low Birth Weight: 1.0 – 1.49 kg	45 (12%)
▪ Low Birth Weight: 1.5 – 2.5 kg	158 (40%)
▪ > 2.5 kg	138 (35%)

DOSING APPROPRIATENESS

Figure 1: Dosing Appropriateness of Beractant and Poractant Alfa



INVENTORY IMPROVEMENT OPPORTUNITIES

Figure 2: Optimal Vial Combination* Versus Non-Optimal Vial Combination Utilized Based on Patient Dose and Cost

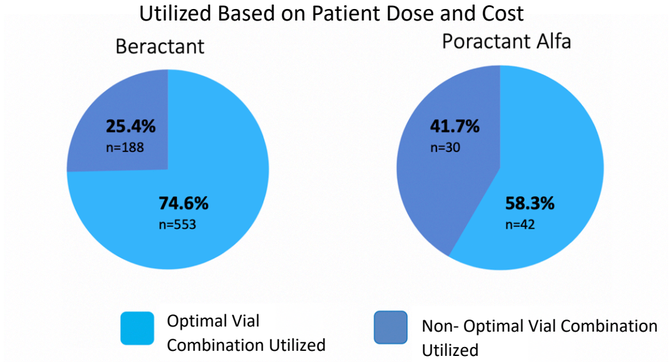
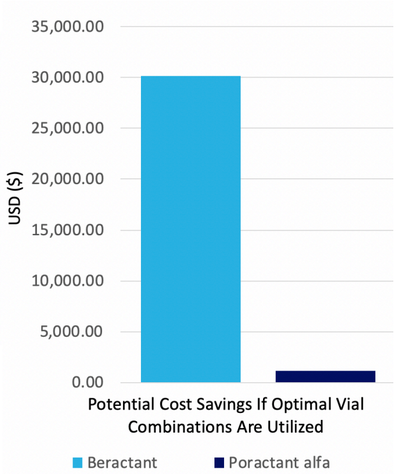


Table 2: Recommendations for Optimal Vial Combinations

Cost Saving Opportunities			
Optimal Vial Combinations*			
Dose	**Beractant**	**Dose**	**Poractant alfa**
≤ 100 mg	1 x 4 mL vial	≤ 120 mg	1 x 1.5 mL vial
101 – 200 mg	1 x 8 mL vial	121 – 240 mg	1 x 3 mL vial
201 – 300 mg	3 x 4mL vial	241 – 360 mg	3 x 1.5 mL vial
301 – 400 mg	2 x 8 mL vial	361 – 480 mg	2 x 3 mL vial
401 – 500 mg	3 x 8 mL vial	481 – 600 mg	5 x 1.5 mL vial

* The optimal vial combination provides the greatest cost savings while fulfilling the total patient dose

Figure 3: Cost Saving Opportunities



DISCUSSION

- In reviewing this medication use evaluation, we identified two opportunities for improvement: an opportunity to improve dosing appropriateness and an opportunity to optimize drug inventory purchasing and utilization.
- An opportunity to improve dosing appropriateness was noted as 13.8% of beractant orders and 26.4% of poractant alfa orders deviated more than ± 10% from the recommended dosing per patient weight (Figure 1). Greater deviations in poractant alfa were expected due to more complex dosing and differences in rounding. Reductions in dosing deviations may be potentiated through pharmacy-driven initiatives and prescriber education.
- An opportunity to improve inventory utilization of beractant and poractant alfa within the institution was also noted as there was a cost savings opportunity with an alternative vial combination with every:
  - 1 out of 4 beractant orders (25%)
  - 5 out of 12 poractant alfa orders (42%)
- Additionally, optimal use of surfactant inventory from May 2019 to April 2020 might have resulted in a potential cost savings of up to $31,266.
- Upon inspection of electronic system processes, it was discovered that only one vial size can be scanned out for an individual order. As a result, using a combination of different vial sizes for the same drug would require bypassing the barcode scan.
- During workflow review, we identified instances in which the product vial sizes scanned did not always match the vial sizes used, and thus the estimated cost savings may be an over-estimate.
- Suggestions for improvement include prescriber education regarding appropriate dosing for beractant and poractant alfa, updating informatics technology to allow for the scanning of same drug-different vial size combinations, and implementation of the dosing chart for beractant (Figure 3) to optimize inventory utilization of available products. This study also determined that addition of the 3mL poractant alfa vial to formulary is not justified by potential cost savings as wasting 3 vials in a 9 month period would off-set any potential monetary gain.
- Future studies to build on our current observations may include evaluating the associations between:
  - Patient demographics and dosing appropriateness
  - Dosing appropriateness and clinical outcomes
  - Implementation of the dosing chart and actual cost savings

CONCLUSIONS

This medication use evaluation has identified a cost savings opportunity with every 1 in 4 beractant orders and every 5 in 12 poractant alfa orders within the facility. Implementation of the beractant dosing chart has the potential to save the institution up to thirty-thousand dollars in a nine-month period. Dosing was evaluated and found to be appropriate in 86.2% of beractant orders and 73.6% of poractant alfa orders, which may be improved with pharmacy-driven prescriber education.

REFERENCES

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