Reduction in True Cost of Tracheostomy in Neonates with Family-Centered Care Coordination Program

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SUMMARY

Introduction: The implementation of value-based care models is becoming critical in order to reorganize clinical care delivery with the patient at the center. We are at a tipping point in our changing healthcare climate, where the goal has been misaligned with delivery. The goal of any health care system is to improve the value delivered to patients. Value in health care is defined as the patient outcomes achieved per dollar spent. Thus, measuring value in health care involves the identification of relevant health outcomes as well as determining the total relevant treatment costs. Thus, defining costs of a given procedure is a necessary step towards determining its inherent value to patients.

Objective: To determine the value associated with implementation of a Family-Centered Care Coordination (FCCC) program for neonates undergoing tracheostomy using validated time-driven activity-based costing (TDABC).

Methods: TDABC was used to estimate the cost of care for neonates undergoing tracheostomy both before and after implementation of a FCCC program at the Massachusetts Eye and Ear Infirmary and MassGeneral Hospital for Children. Retrospective chart review was performed in order to estimate average length of stay (LOS) for NICU tracheostomy patients. Quality outcomes are based on 1 month Pediatric Tracheostomy Health Status Instrument (PTHSI) and 6 month Medical Complications Associated with Pediatric Tracheostomy (MCAT) scores.

Results: Following implementation of the FCCC program, the average LOS at our hospitals decreased from 30 days to 16 days for a tracheostomy in a neonate. Based on process maps detailing six phases of care and varying personnel involvement, FCCC reduced the cost associated with a single neonatal tracheostomy placement by $7,271.92 . A clinically meaningful benefit was demonstrated for both PTHSI (effect size 0.90) as well as MCAT scores (effect size 11.54).

Conclusion: This study uses a value-based care model to define the value associated with implementation of the FCCC program for neonates undergoing tracheostomy. This is an innovative approach to designing value-based initiatives in order to decrease parental and caregiver burden.

METHODS

Patient population: TDABC was used to estimate the cost of care of patients undergoing tracheostomy at the Massachusetts Eye and Ear Infirmary (MEEI) with pre-operative and post-operative care at MassGeneral Hospital for Children both prior to and following initiation of the FCCC program. FCCC is a collection of programs, policies, and tools designed to ensure a safe transition home for children undergoing tracheostomies, reduce readmission rates, and minimize caregiver burden (Figure 1)[1]. Retrospective chart review was performed to estimate average length of stay. Outcomes included average post-operative PTHSI and MCAT scores both prior to and following initiation of the FCCC initiative.

TDABC: In applying the methodology, we first have to define the studied care cycle. The patient care cycle started on the first day of hospitalization, with admission or transfer from another facility. The end of the care cycle was set at the day of discharge from MGH. Care cycle maps were constructed to outline each step of care that needed to be accounted for in the TDABC analysis. Process maps were made detailing each interaction between the patient and hospital personnel, the minutes of duration for each interaction, the space in which each interaction took place, and the equipment for each step. The cost for each resource - provider, space, and equipment- for each step could be calculated by multiplying each resource's capacity cost rate by the length of time the resource was used at each step. Unit costs were calculated as capacity cost rate, measured in dollars per minute. These costs were added to quantify the total cost of each step, and the total costs of each step were summed to arrive at a total cost for each process map. The total care cycle cost was then obtained by adding the costs of each process map.

Outcome Measures: Outcomes are based on 1 month Pediatric Tracheostomy Health Status Instrument (PTHSI) and 6 month Medical Complications Associated with Pediatric Tracheostomy (MCAT) scores. These scores were taken in 10 patients prior to initiation of FCCC and in 12 patients following initiation of FCCC.

Statistical Analysis: Two-sided student's t-tests were used to calculate pre-initiative and post-initiative means with normally distributed data. *p* values <0.05 were considered statistically significant. Standardized mean difference (Cohen's *d*; effect size) was also calculated with <0.2= trivial effect; 0.2-0.5 = small effect; 0.5-0.8 = moderate effect; > 0.8= large effect[2].

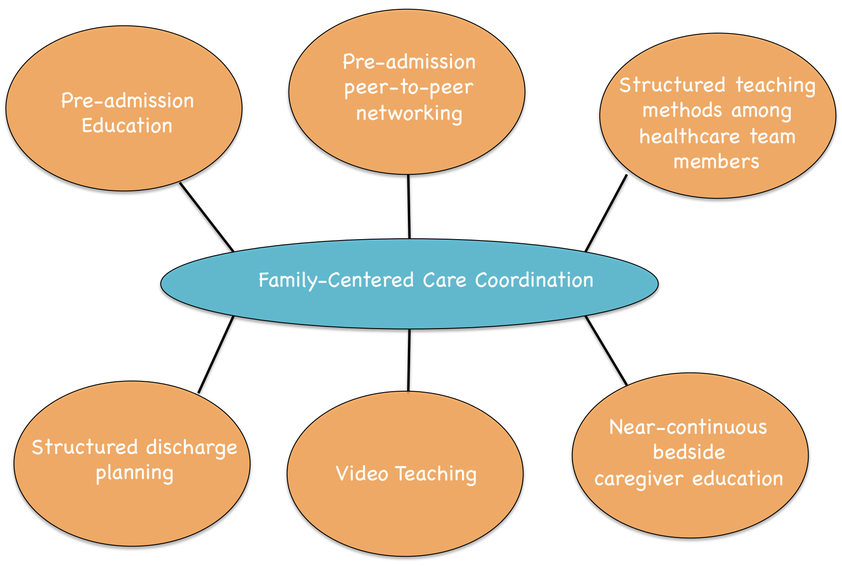

Figure 1: FCCC Program Model

RESULTS

- The FCCC program decreased average LOS for tracheostomy placement from 30 days to 16 days in a neonate.
- 6 phases of care were detailed in process mapping.
- FCCC program decreased total cost for one cycle of care from $18,279.30 to $11,007.38, with a calculated decrease of $7,271.92.
- Mean PTHSI decreased from 116.9 to 99.5 ($p<0.04$) MCAT scores decreased from 15.2 (SD = 1.1) to 1.3 (SD 1.3) ($p<0.0001$).
- A largely clinically meaningful benefit was demonstrated for both PTHSI (effect size 0.90) as well as MCAT scores (effect size 11.54).

DISCUSSION

In this study, TDABC was used to determine the value of a multidisciplinary, family-centered program for post-operative tracheostomy teaching. As quality of care is becoming more defined by patient reported outcome measures and quality of life, such initiatives are imperative to maximize outcomes for patients. In our experience, we have found families value a balance between both the multidisciplinary team and communication from a team leader, or "Quarterback," delivering information to families in a concise, straightforward way. In this way, information is synthesized for families by the team leader leading to less miscommunication which can both decrease outcomes (QOL) and increase cost (LOS).

Furthermore, our study demonstrated an average daily cost of admission of about $600. This is in stark contrast to traditional hospital charge costing associated with ICU admission, estimated by our colleagues at roughly $9k-$10k. As our length of stay decreased by about 14 days with FCCC and a tracheostomy care coordinator, by traditional cost accounting this would be a cost savings of about $140k per tracheostomy care cycle if such personnel were employed and programs put in place. As the TDABC savings per care cycle was about $7k, it can be inferred that, with TDABC cost accounting, any children's hospital performing >10 neonatal or pediatric tracheostomies a year may well find it cost effective (not to mention *valuable*) to have a tracheostomy care coordinator and a coordinated care plan (such as FCCC) in place. Investing in creation of this FCCC model delivers a return on investment by the value generated via improved outcomes at lower costs. With $140k in charges saved per patient, our model has already more than paid for an additional trach coordinator. Better, faster, and cheaper. For both the deliverers of care and the families.

In summary, TDABC is the only patient centered method for assessing cost and value. It is an invaluable tool in estimating value associated with initiatives to increase quality of care for families and serves as an innovative model for evaluating future initiatives designed to increase value of care for patients.

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