Developing & Implementing a Foundational Pathway for Airway Reconstruction Surgery

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DNP SCHOLARLY PRACTICE CHANGE TEAM

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LTS IS AIRWAY RESTRICTION

- Laryngotracheal stenosis (LTS) is a term describing a variety of rare upper airway narrowing diagnoses
- LTS symptoms:
  - Airway obstruction
  - Difficulty breathing
  - Voice difficulties
  - Swallowing difficulties

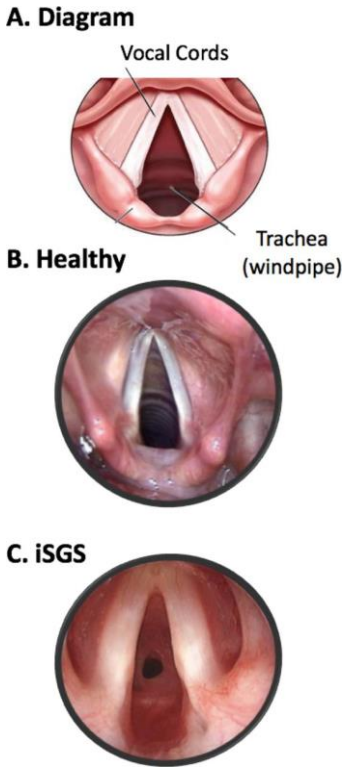


Image from Gelbard et al., 2018

LTS ETIOLOGY & TREATMENT

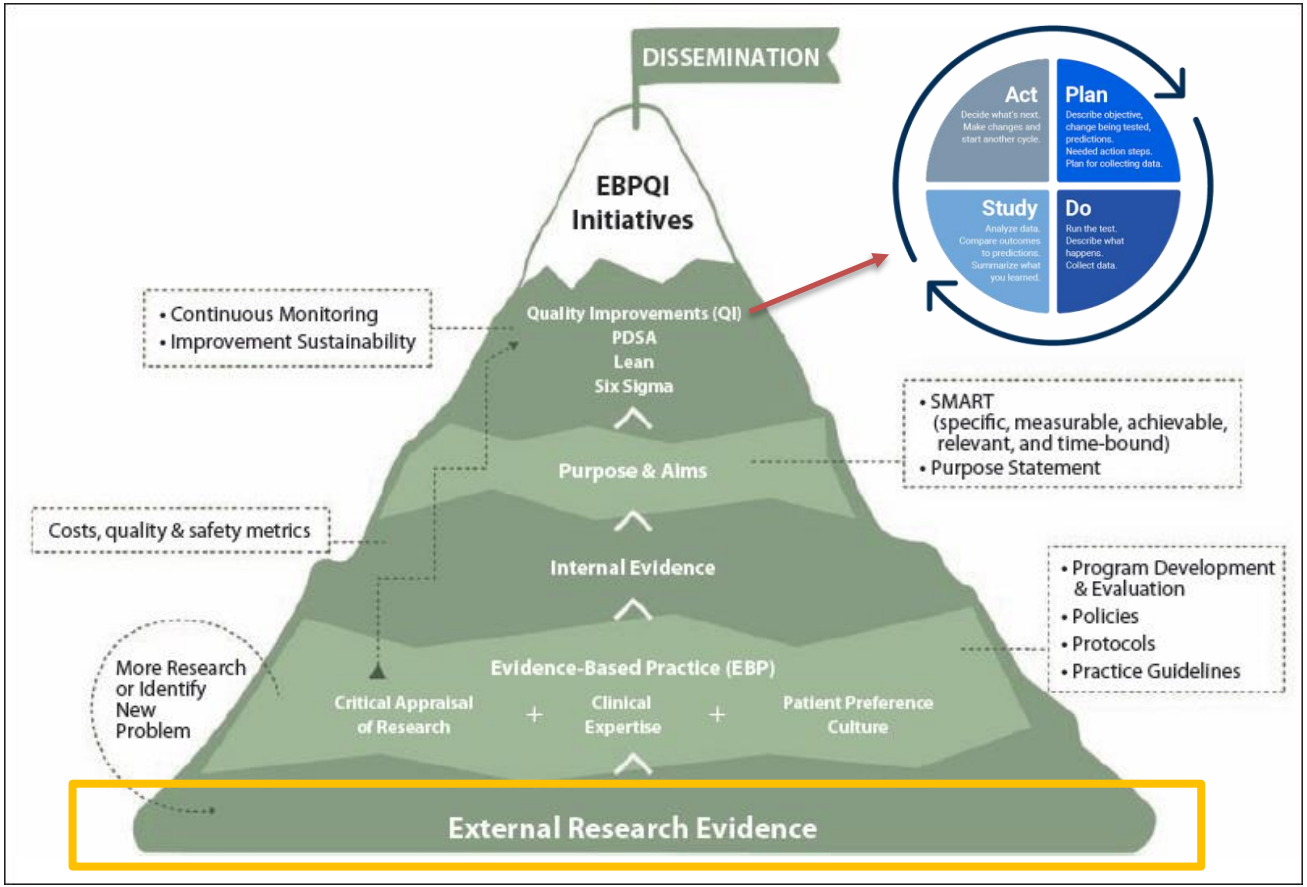
- Most common etiology of LTS is iatrogenic
- LTS is over-reactive healing, leading to hypertrophic scar formulation (Carpenter et al., 2022)
- Current management is primarily surgical
- There is poor prognosis

THE GAP & PPCO

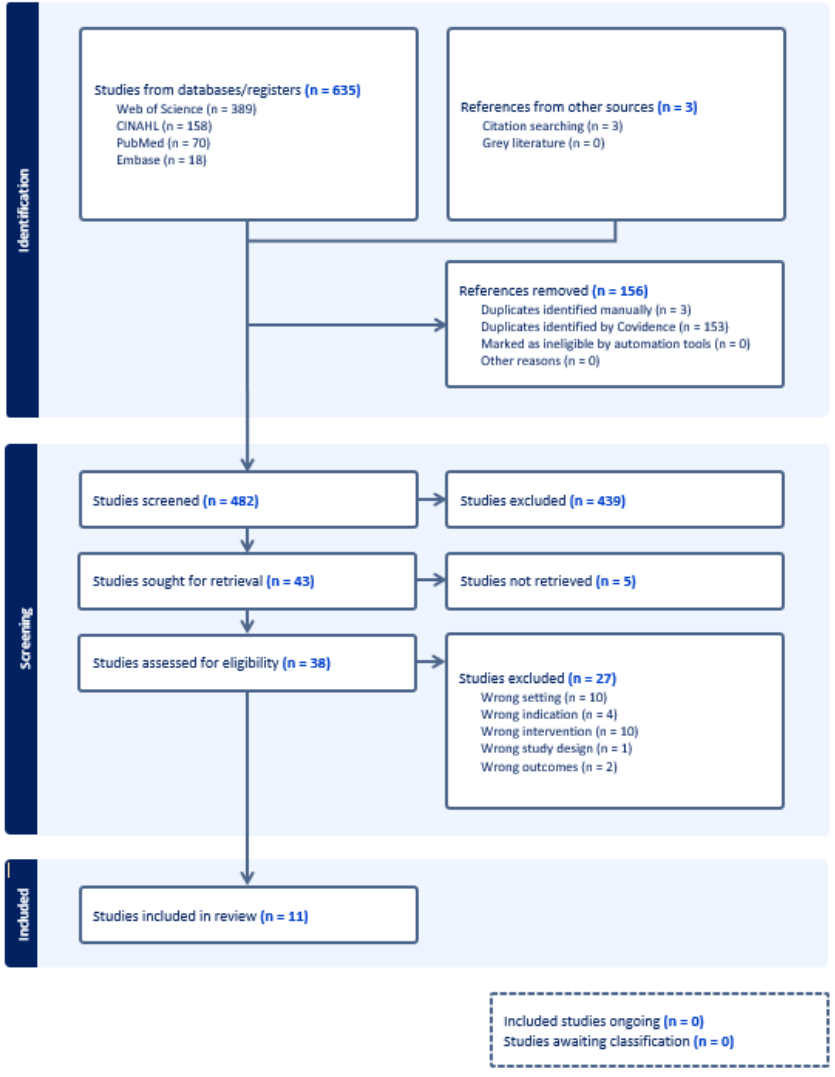
- The gap in knowledge:
  - A lack of standardized protocol (Razura et al., 2023)
- PPCO question:

Will the development and implementation of a clinical care pathway for adult airway reconstruction surgery improve patient throughput and outcomes?

THE MOUNTAIN MODEL



(Waldrop & Dunlap, 2024)



PRISMA DIAGRAM: CCP LITERATURE REVIEW

CCP LITERATURE REVIEW

Three Themes:

1. The need for a CCP
2. The components of the CCP
3. CCP outcomes

CCPs in Otolaryngology:

1. Laryngectomy (3)
2. Head & neck cancer:
   i. Microvascular reconstruction (6)
   ii. Major reconstruction (1)

**No CCPs for LTS

Table 1. Head and Neck Construction Clinical Pathway

	Day of Surgery	POD-1	POD-2	POD-3	POD-4
Trachea	Sterile for 72 hr	Cuff deflated by RT upon arrival to unit 30/31		Routine trachea care protocol	
Flap donor	Donor remains dressed for 5 days				
Skin graft donor		Remove outer covering over donor-site dressing			
Flap checks	Every hour for 48 hr	→	Every 2 hr for 48 hr	→	Every 4 hr for 48 hr
Drains					
Laboratory		CBC, lytes, CA, Phos, Mg, Cr, glucose INR (usually completed in ICU prior to transfer)	CBC, lytes, CA, Phos, Mg, Cr, glucose INR	CBC, lytes, CA, Phos, Mg, Cr, glucose INR	
Vital signs	Every hour for 48 hr	→	Every 2 hr for 48 hr	→	Every 4 hr for 48 hr
Suture care					
IV therapy/ antibiotics		Antibiotics should be discontinued 3 doses postop TFI ordered		IV rate should be adjusted according to tube feed rate to accommodate TFI order	
Pain management	PCA	PCA	PCA	PCA	
CIWA	Start if appropriate				
Activity	Bedrest		Sitting in bed or on bedside	Activity as tolerated	
Nutrition	NPO → trickle Feed	Tube feed starts (24 hr)			
Elimination				Discontinue Foley; simple bowel routine ordered	
Physiotherapy		Chest physiotherapy ordered on all patients			
Miscellaneous		PT, dietician, respiratory, social work, transition services consults	Cancer center nurse sees patient regarding follow-up appointments	OT consult for splint on POD 5 - consult to speech pathology	

CCP EXAMPLE

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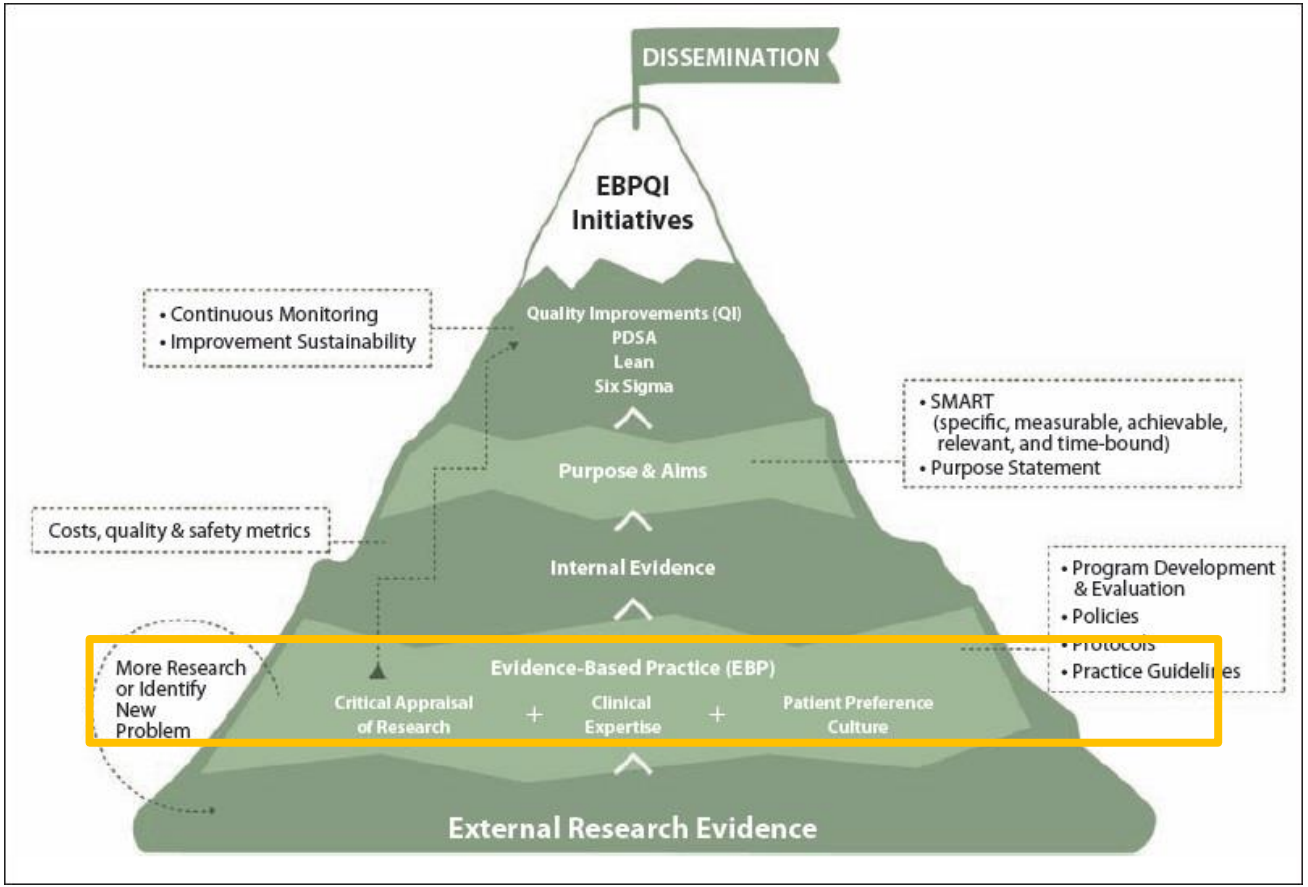
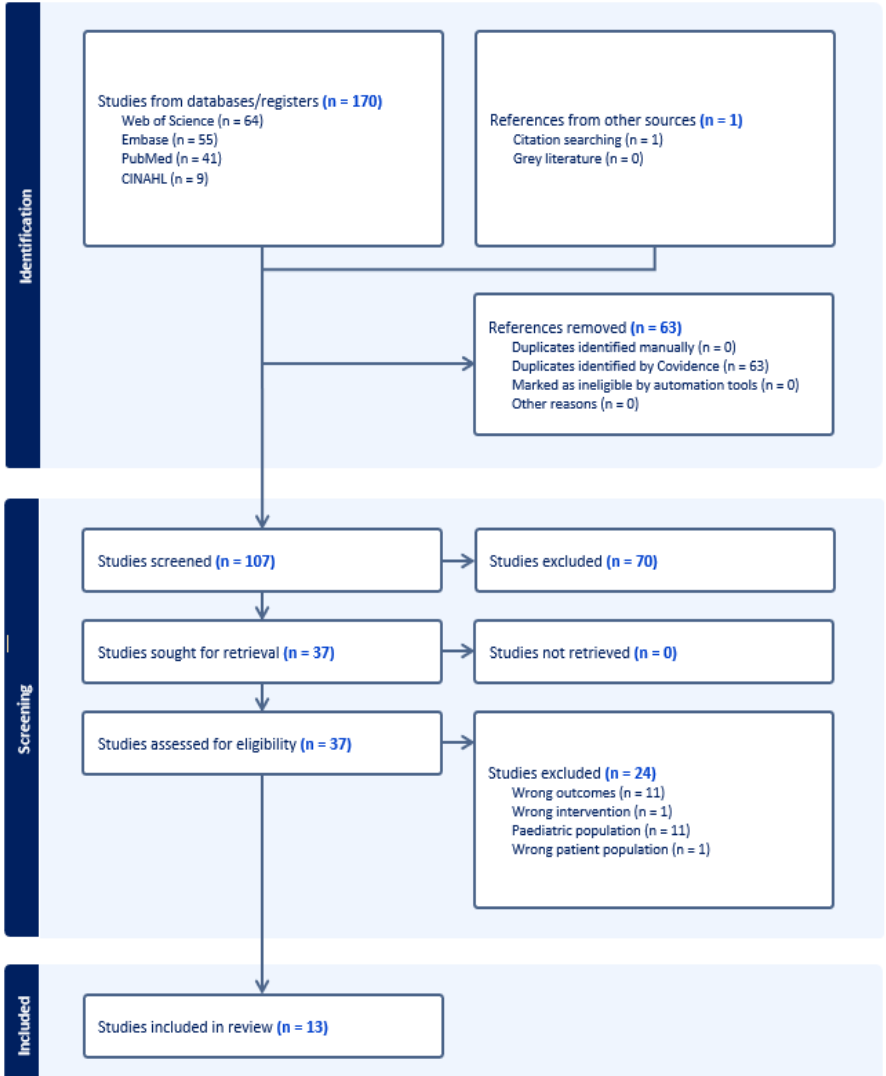
EVIDENCE-BASED PRACTICE (EBP)





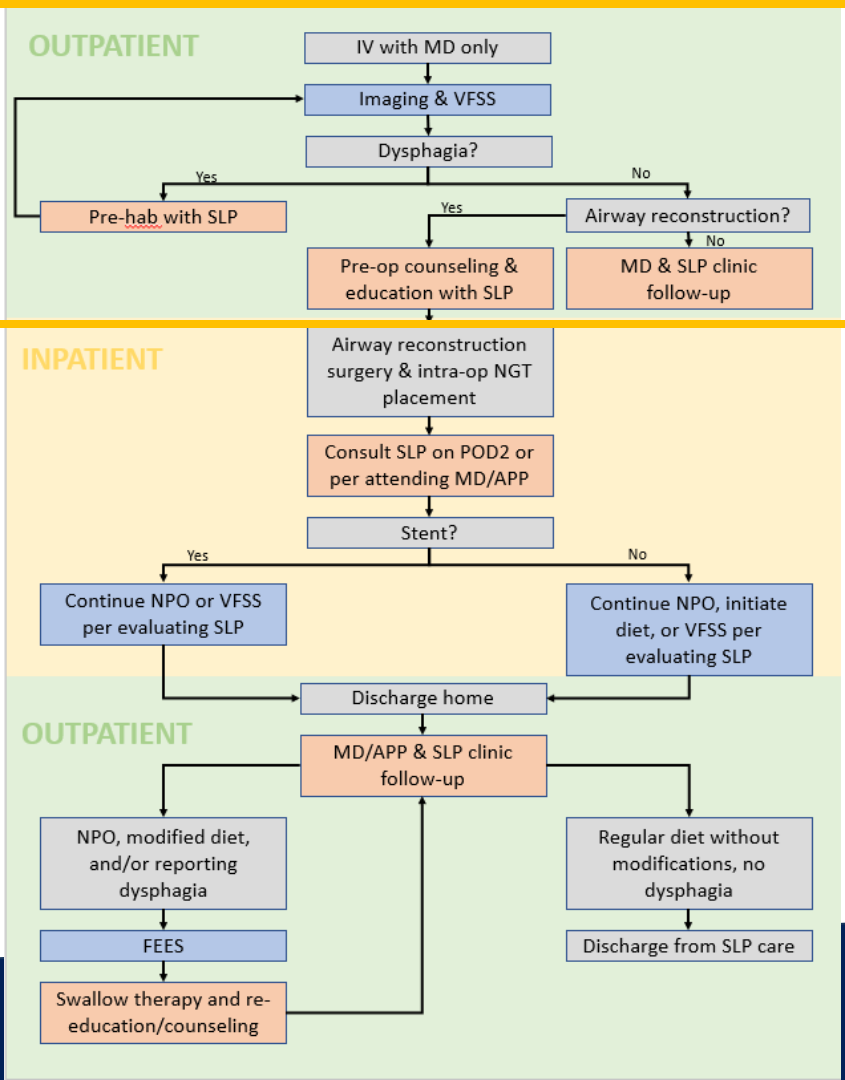
PRISMA DIAGRAM: SLP LITERATURE REVIEW

SLP LITERATURE REVIEW

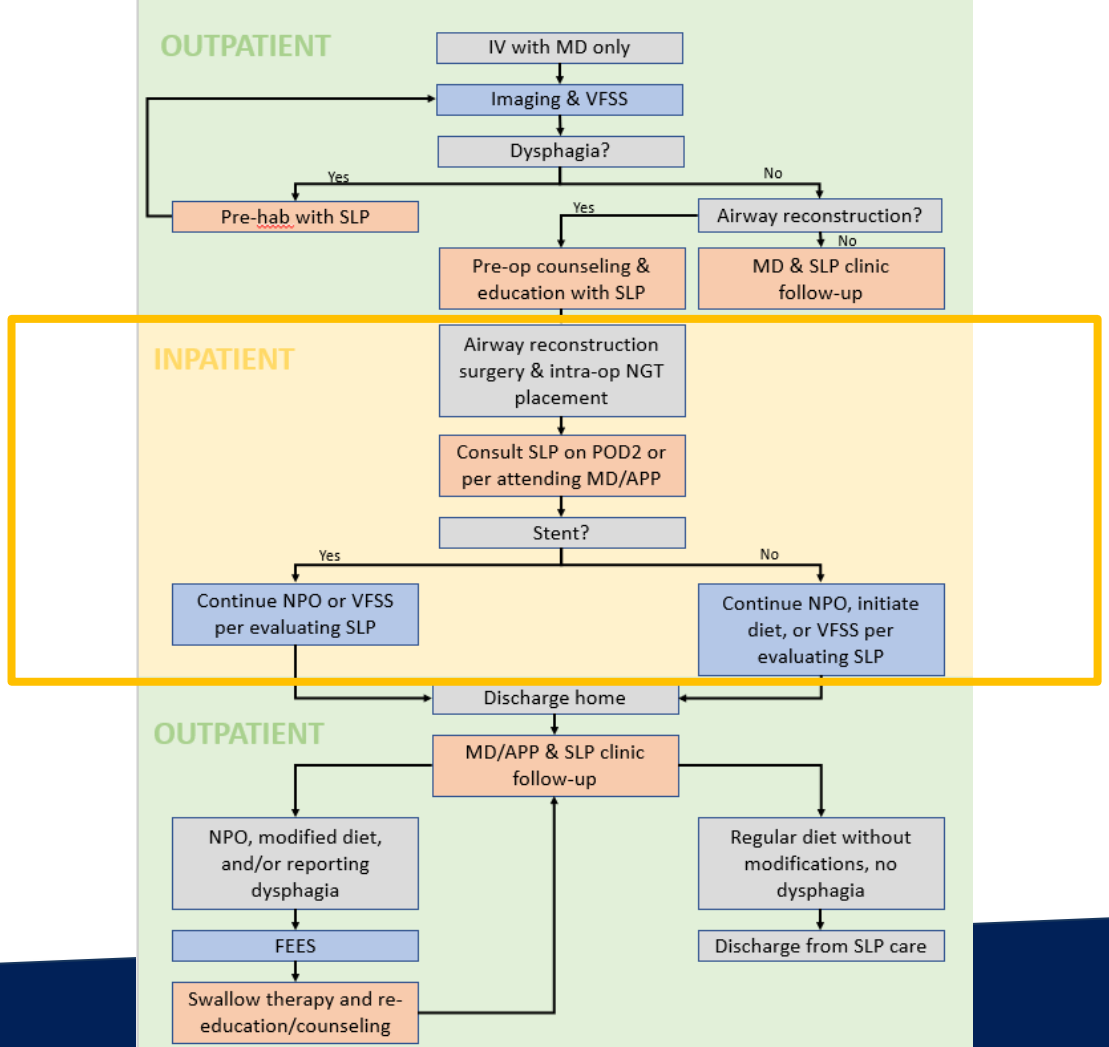
Three themes:

- Pre-operative patient education and counseling sessions
- Standardized instrumental swallow evaluation timepoints
- Patient reported outcome measures (PROMs) at regular intervals

DEVELOPMENT OF THE FOUNDATIONAL PATHWAY



DEVELOPMENT OF THE FOUNDATIONAL PATHWAY



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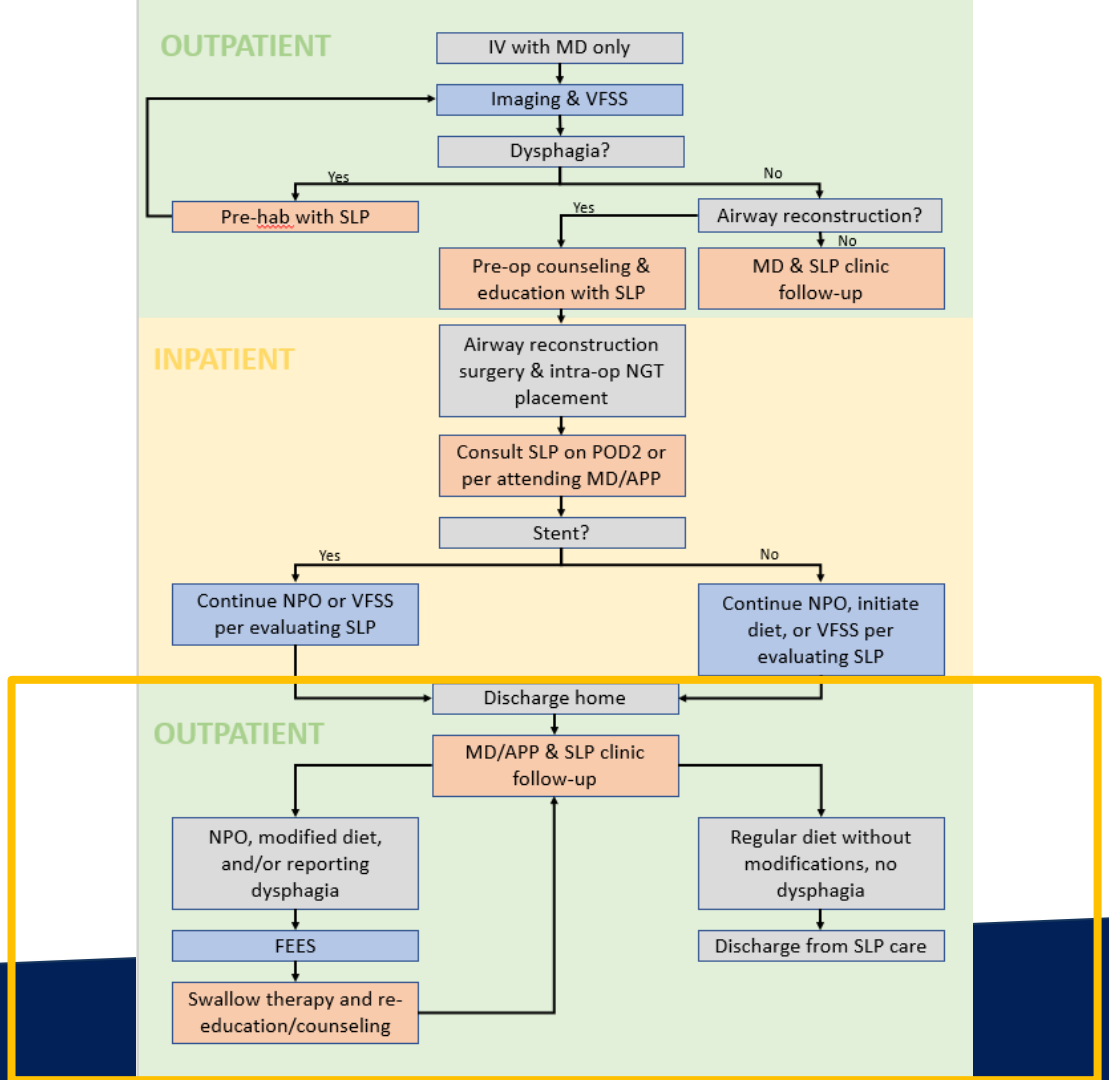

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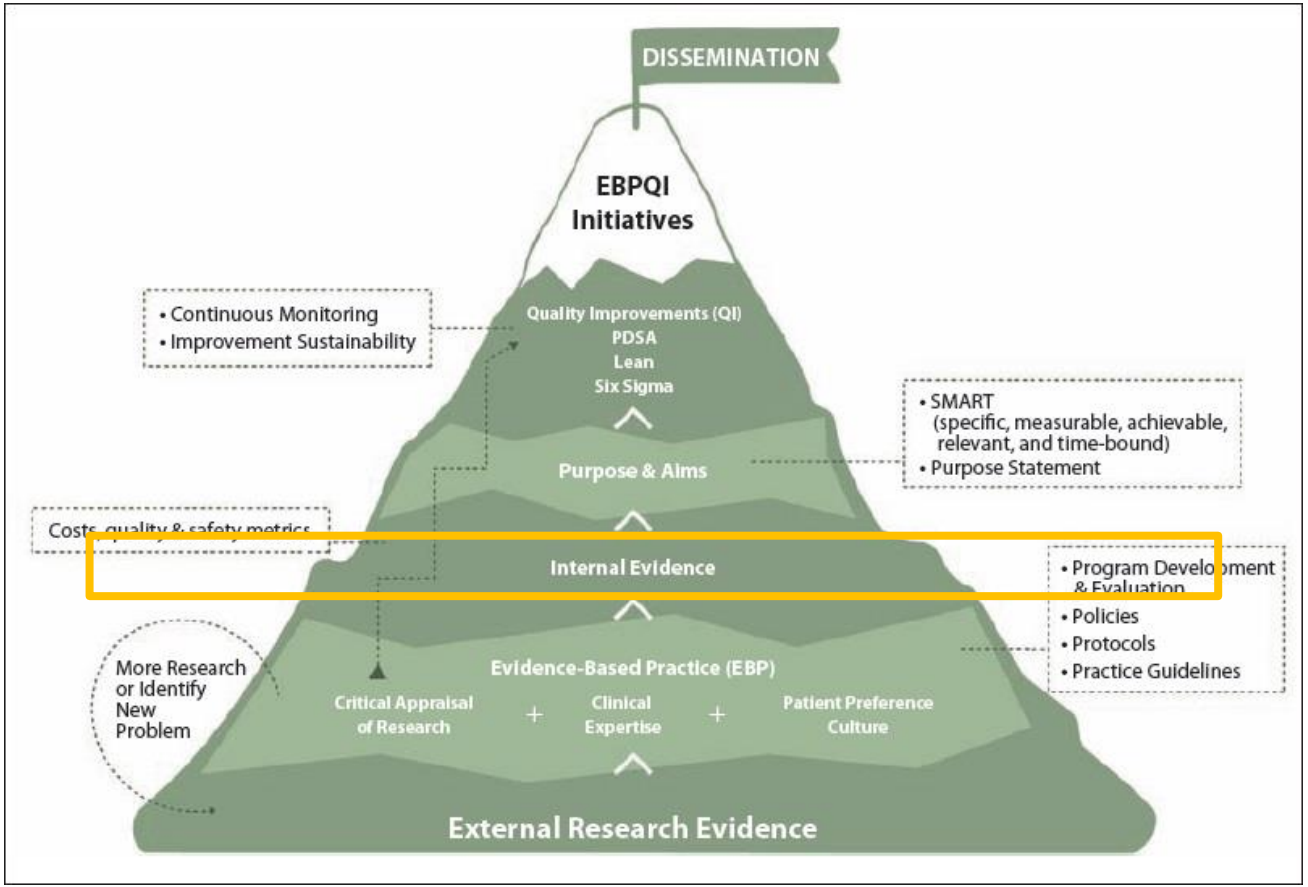
DEI & ETHICAL CONSIDERATIONS

- Patient wellbeing:
  - Beneficence
  - Safety
  - Non-maleficence
- Autonomy:
  - Patient shared decision making
  - Clinician critical thinking
- Justice & Equity

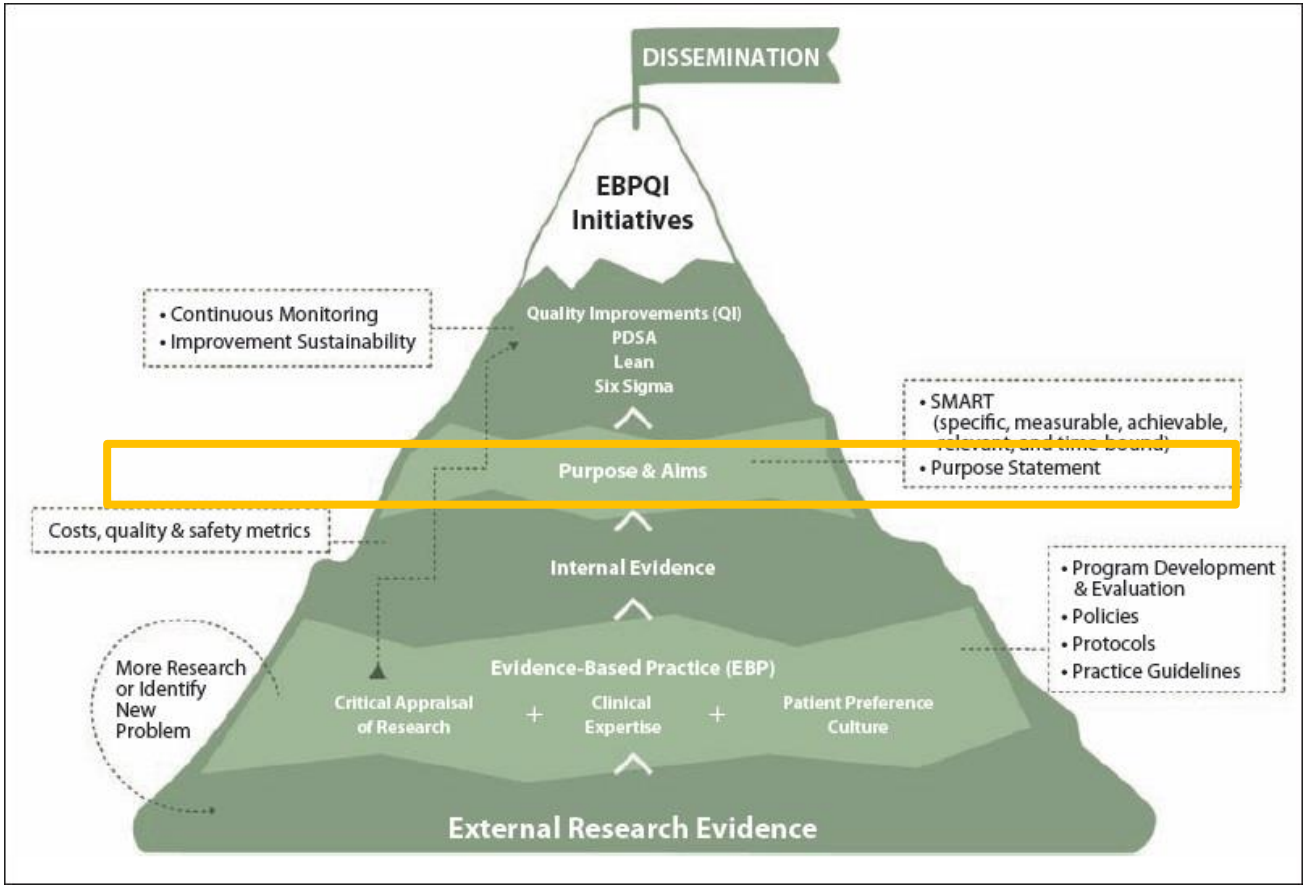
INTERNAL EVIDENCE: OUTCOMES



INTERNAL EVIDENCE: OUTCOMES

- **Patient outcomes measured:**
  - Length of hospital stay (time from surgery to discharge)
  - Length of time NPO
- **Process outcomes measured:**
  - Staff behavior change survey

PURPOSE & AIMS



PURPOSE & AIMS

SMART goal:

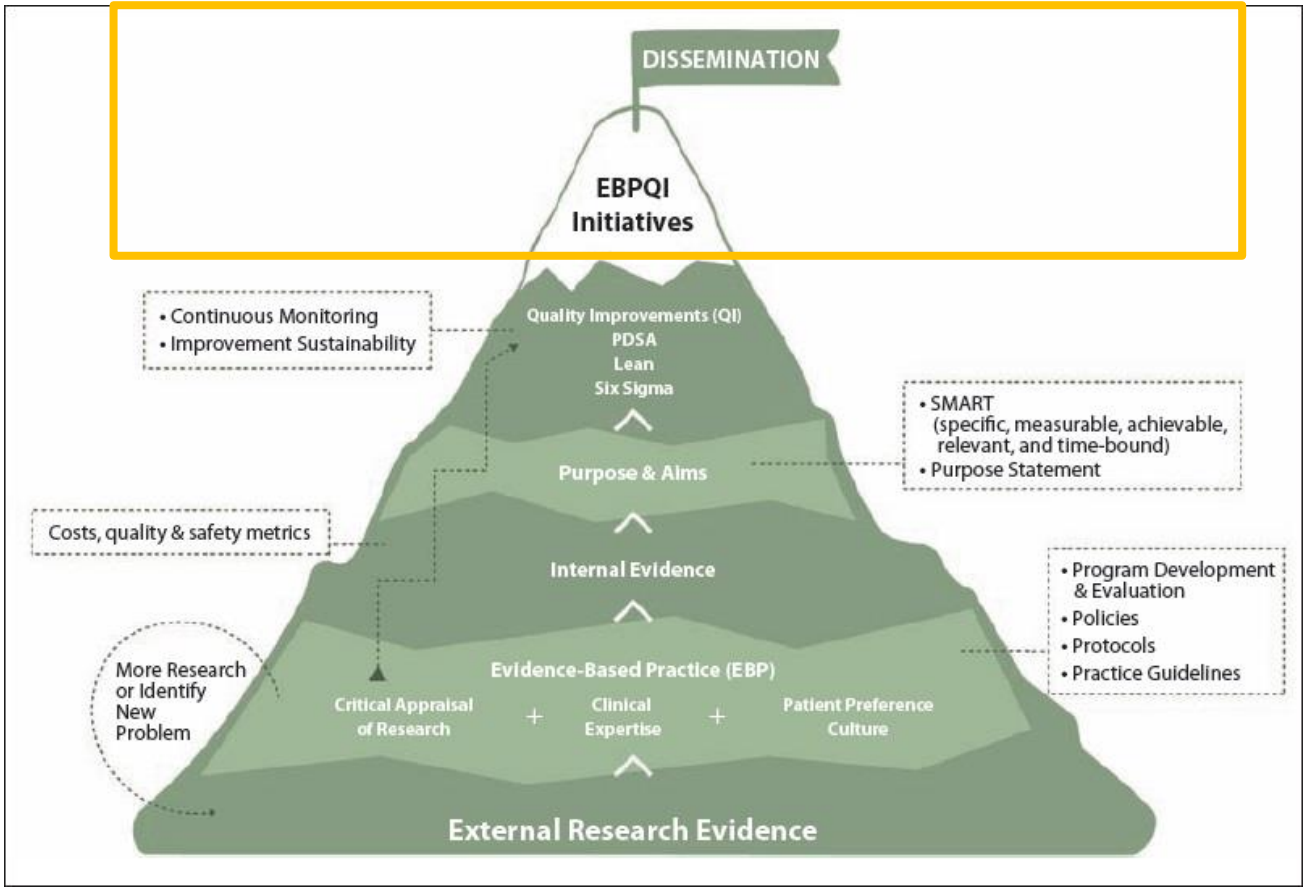
Specific: Create a CCP with key stakeholders for airway reconstruction surgery patients

Measurable: Collect data on length of hospital stay and time to resume normal diet

Achievable: Bi-weekly to monthly key stakeholder meetings

Relevant: Improved patient throughput and outcomes

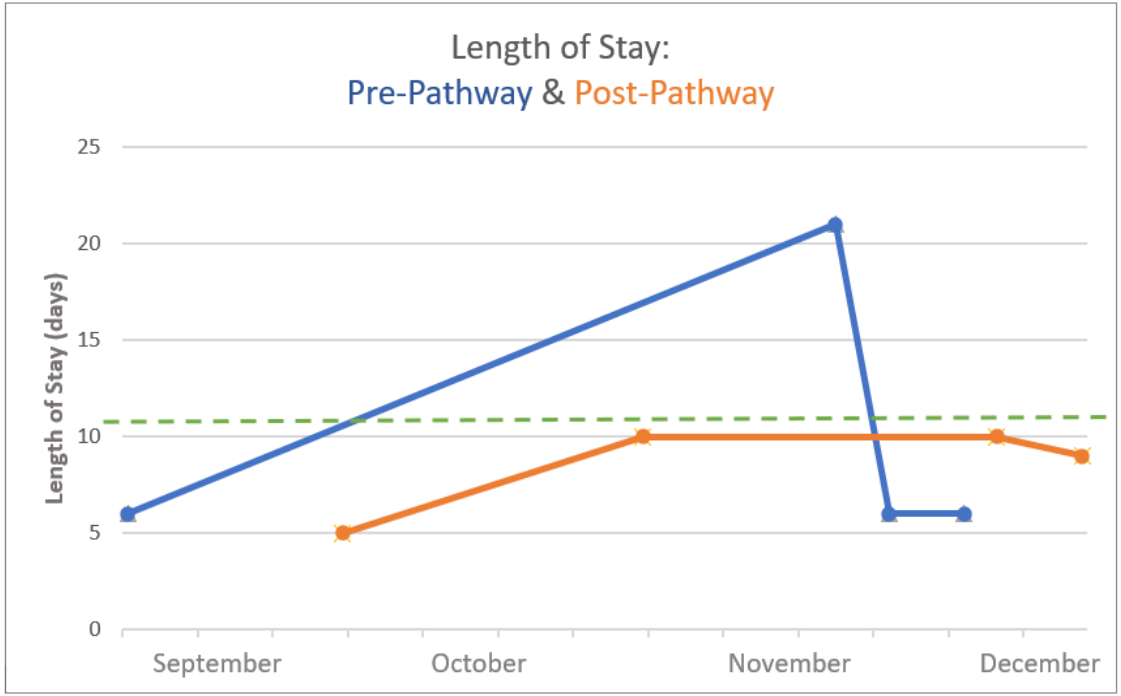
RESULTS


DISSEMINATION
EBPQI Initiatives
• Continuous Monitoring
• Improvement Sustainability
Quality Improvements (QI)
PDSA
Lean
Six Sigma
• SMART (specific, measurable, achievable, relevant, and time-bound)
• Purpose Statement
Purpose & Aims
Costs, quality & safety metrics
Internal Evidence
• Program Development & Evaluation
• Policies
• Protocols
• Practice Guidelines
More Research or Identify New Problem
Evidence-Based Practice (EBP)
Critical Appraisal of Research
+
Clinical Expertise
+
Patient Preference Culture
External Research Evidence

RESULTS: LOS

Pre-pathway =
9.75 days

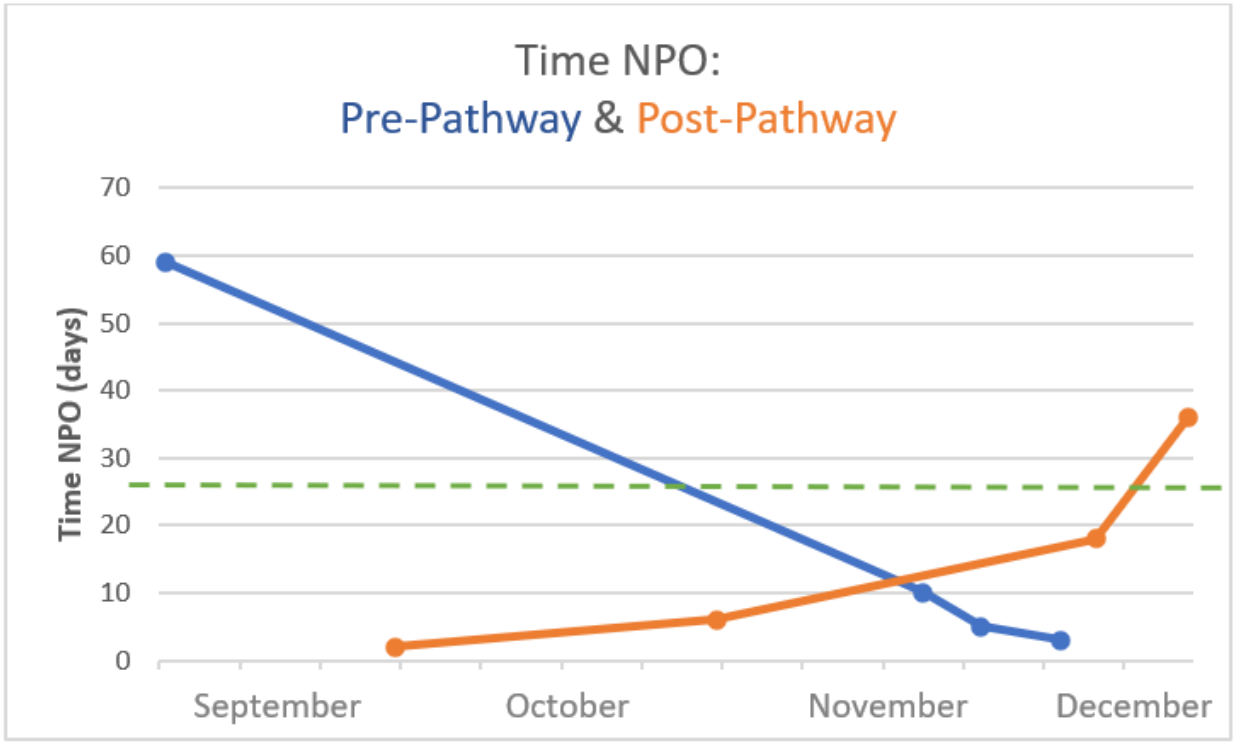
Post-pathway =
8.5 days



RESULTS: NPO

Pre-pathway =
19.25 days

Post-pathway =
15.5 days



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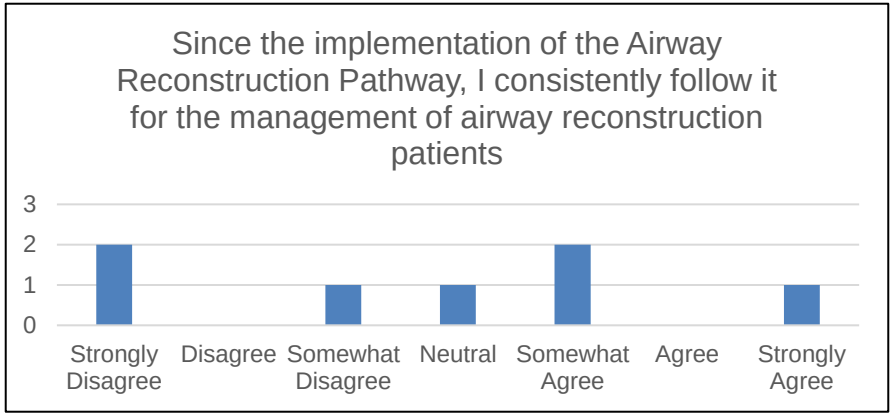
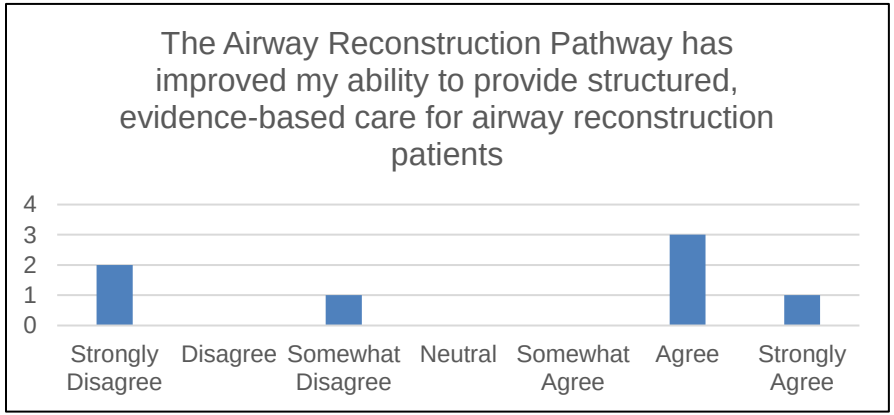
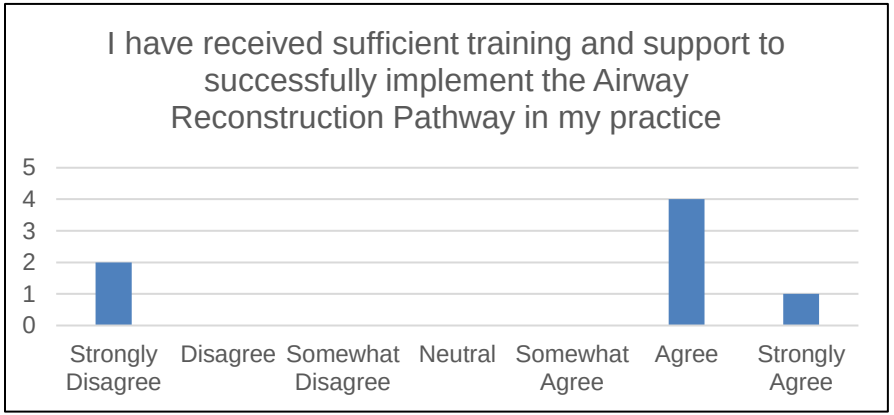
STAFF SURVEY







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STAFF SURVEY: NARRATIVE FEEDBACK

Themes:

- The need for improved communication from attending physicians and residents
- The need for consistent patient education and patient expectations

FINANCIAL ANALYSIS

- Surgery associated costs:
  - Airway reconstruction surgery = $152,000 to $160,000
  - Average daily ICU cost in the USA = $10,794 + $3,496 = **$14,290/day**
  - Average inpatient daily cost in VA for non-ICU hospital ward = **$2,871/day**
  - Cost of enteral nutrition while NPO in the USA = $80 to $200, average = **$140/day**

FINANCIAL ANALYSIS

Estimated Cost Savings of a Foundational Pathway for Airway Reconstruction Surgery

		Year 1	Year 2	Year 3	3 Year Total
Program Expense	**Notes**	**Hours worked**	**Hours worked**	**Hours worked**	**Total**
Pathway Development	Graduate student project	336 hours	0 hours	0 hours	No cost to clinic
Interdisciplinary time (meetings, literature review)	Staff: unit managers, surgeons, speech language pathologists (SLP), nurses	20 hours	5 hours	5 hours	30 hours
SLP counseling time	1-hour session	7 hours	7 hours	7 hours	21 hours
Staff Education	1-hour session	2 hours	2 hours	2 hours	6 hours
Annual Expense		**29 hours**	**14 hours**	**14 hours**	**57 hours**

FINANCIAL ANALYSIS

Cost Savings/Cost Avoidance					
		Year 1	Year 2	Year 3	3 Year Total
MEASURE	**Notes**	**Cost Savings**	**Cost Savings**	**Cost Savings**	**Total**
Length of Hospital Stay (LOS)	Pre-pathway = 9.75 days, post-pathway = 8.5 days. Daily hospital cost $2,871 + 2-day ICU stay $14,290. Pre-pathway = $36,540.25. Post-pathway = $32,951.50.	$3,588.75 x7 surgeries per year = $25,121.25	$25,121.25	$25,121.25	$75,363.75
Time Spent Nothing by Mouth (NPO)	Pre-pathway = 19.25 days, post-pathway = 15.5 days. Average daily enteral cost = $140. Pre-pathway = $2,695. Post-pathway = $2,170.	$525 x7 surgeries per year = $3,675	$3,675	$3,675	$11,025
Revenue		**$28,796.25**	**$28,796.25**	**$28,796.25**	**$86,388.75**
Return on Investment		**N/A**	**N/A**	**N/A**	**N/A**

LIMITATIONS

- Small sample size
- 3 different surgeons
- Short data collection period
- Incongruent staff survey results
- Table 1 group comparison

Table 1

Patient Demographics

Characteristic	Post-Pathway *n* = 4	Pre-Pathway *n* = 4
Age		
20-34	–	2
35-44	3	–
45-54	–	1
55-64	1	–
65-74	–	1
Gender		
Female	2	2
Male	2	2
Clinical Comorbidities and Risk Factors		
AID or IMID	1	1
Cardiovascular	1	2
Diabetes	1	1
GERD	–	1
H&N CA tx	–	1
Obesity	1	–
COPD/Asthma	–	1
Neck trauma	2	3
Smoking	2	2
Surgical Approach		
CTR	3	1
ETSA	0	2
LS	1	1

Note. AID = autoimmune disease; IMID = immune-mediated inflammatory disease; GERD = gastroesophageal reflux disease; H&N CA tx = head and neck cancer treatment; COPD = chronic obstructive pulmonary disease; CTR = cricotracheal resection; ETSA = excision tracheal stenosis and anastomosis; LS = laryngoplasty with stent

FUTURE IMPLICATIONS & SUSTAINABILITY

- PDSA cycle #3
- Enhanced staff training
- Incorporating a change management model
- Improving team communication strategies
- Larger sample size
- Longer data collection window
- Ongoing PDSA cycles: sustainability & improvement