A Tooth Autotransplantation Cost Model for Children with Missing Teeth

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ABSTRACT

Objectives: Tooth autotransplantation is a proven and effective treatment option for children with missing teeth. However, it's not often considered, partly due to the lack of knowledge about its practicality and costs. In this study, we sought to analyze and compare costs of tooth autotransplantation with the most common tooth replacement options currently being utilized in the pediatric population.

Methods: A comprehensive literature review and expert panel were used to establish treatment clinical pathways. Procedural costs (p) were calculated using current CDT codes, and their corresponding fees from FAIRHealth data. Time costs (t) were calculated using the U.S. Bureau of Labor Statistics hourly wage data and number of visits. Using the data gathered, a cost model was constructed, comparing each treatment option with their associated costs.

Results: The cost model compared anterior maxillary tooth autotransplantation (TA) in patients 8-25 years of age, to the associated costs of single-tooth implants (IP), resin-bonded fixed partial dentures (RBFPD), and orthodontic space closure (OSC). IP without or with orthodontics was more costly (p: $9,186-$15,279), when compared to TA with limited or comprehensive orthodontics (p: $6,134-$10,355). RBFPD was the least costly (p: $4,455; t: $437.38). OSC (p: $9,295; t: $2,186.88) was found to be more costly than TA with limited orthodontics, but less costly than TA with comprehensive orthodontics.

Conclusion: Tooth autotransplantation is a practical tooth replacement option for families, and one that should be considered by dental professionals when presented with a pediatric patient who needs tooth replacement in the maxillary anterior region.

INTRODUCTION

Children and adolescents may often present with congenitally missing teeth or early loss of teeth due to trauma or caries. Management of missing permanent teeth can be a diagnostic and therapeutic challenge for dental providers, partly due to growth changes that occur[20]. Therefore, we ideally want a replacement that adapts to these changes in growth, which ultimately impacts the function, esthetics and long-term stability of the replacement. The most common restorative treatment options that exist for this age range are prosthetic replacement and orthodontic space closure (Figure 1)[12]; however, these options are not ideal for everyone.

Tooth autotransplantations (TA) is a tooth replacement option that adapts with growth changes. It involves replacement using the most biocompatible material – a patient's own tooth. The first surgical protocol was established in the 1960s and since that time it's been implemented in daily clinical practice internationally, showing a 90% survival rate over four decades later, surpassing all data available for other tooth replacement options.[11]

Despite it's well-researched clinical efficacy and benefit, TA is not an option often considered by dental professionals in the U.S, partly due to the lack of knowledge regarding its practicality in their community, and costs (Figure 2).[12] The costs associated with TA and how those costs compare to other tooth replacement options are poorly understood.

Ultimately, the goal is to adopt best-practices that inform and influence stellar patient care. One of those practices must be to objectively pair the disclosure of all treatment options with their associated costs. In this study, we sought to analyze and compare costs of TA with the most common tooth replacement options currently being utilized in the pediatric population.
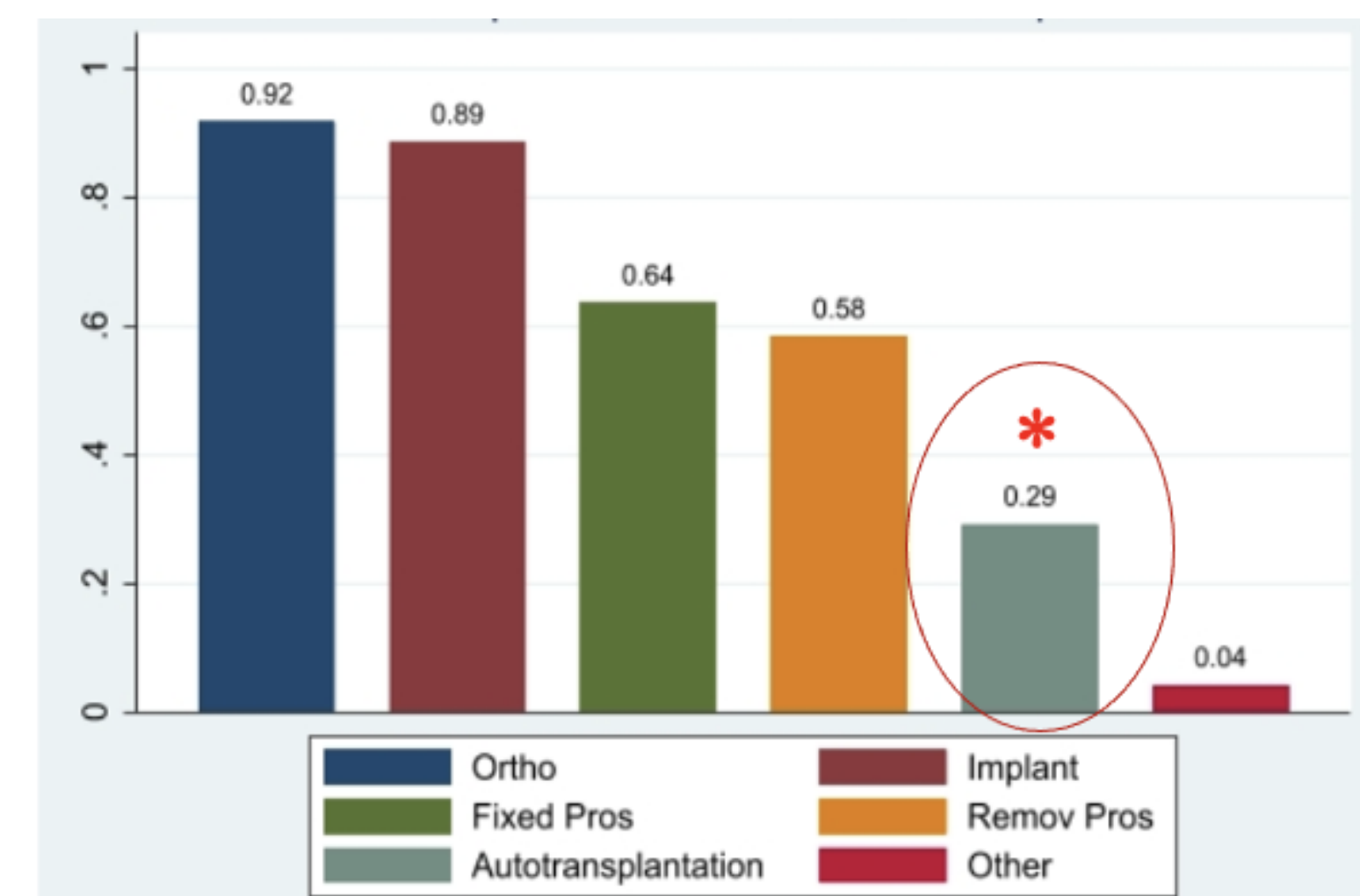

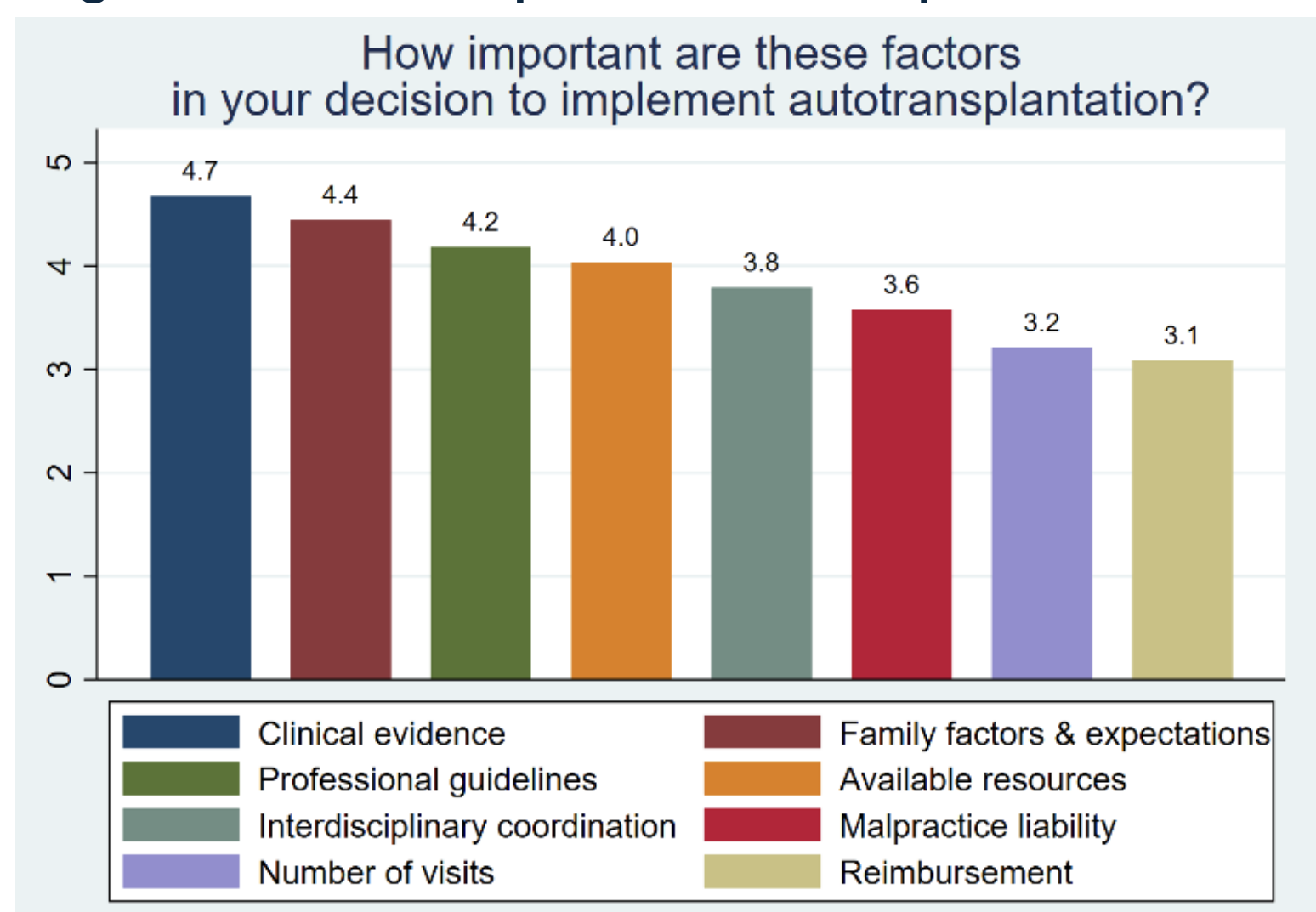**Figure 1: Treatment options for tooth replacement in NC[12]**

Figure 2: Important factors to implement TA in practice in NC[12]

METHODS & MATERIALS

The development of our cost model involved a multistep, iterative process of gathering data from the literature and integrating it with expert consensus. The first step in our model development was a comprehensive review of the literature. We used PubMed to identify all papers published from 2000 through 2024. The purpose of this review was to identify common tooth replacement options currently being utilized, to determine the case study characteristics for inclusion and exclusion criteria, to determine economic costs, and how each treatment option compares to tooth autotransplantation. Our expert consensus came from a group of dental specialists in the fields of oral surgery, periodontology, endodontics, orthodontics, pediatric dentistry, prosthodontics and restorative dentistry. The specialists in each field were strategically chosen due to their expertise utilizing tooth replacement options, including autotransplantation. The purpose of the specialist panel was to discuss common tooth replacement options from a clinical perspective, and to determine their clinical pathways.

Based on the clinical pathways established, and their corresponding procedural steps, 2024 ADA CDT codes were assigned to each step. The fees for each CDT code were gathered using FAIRHealth data reflecting national mean dentist charges from April 1st, 2023 – March 31st, 2024; all specialties included. For codes not included in FAIRHealth data, fees were extrapolated from the 2022 ADA Survey of Dental Fees. A multiplier was applied to the D8080 code based on level of difficulty involved. All fees were added up, in order of procedural step, to calculate the total procedural cost (p) of each treatment option. Time costs (t) were calculated using the U.S. Bureau of Labor Statistics national hourly wage data from August 2024 and number of visits. Each visit was estimated to be 2-3 hours, including travel time. The total costs presented as a range, due to discrepancies that can occur within each clinical pathway. Calculations were based on national average fees, and did not incorporate behavior guidance techniques, insurance coverage, nor additional costs from complications that can arise.

Table 1: Case Study Characteristics

CHARACTERISTIC	
Treatment modality	1). Tooth autotransplantation (TA) 2). Implant-supported prosthesis (IP) 3). Orthodontic space closure (OSC) 4). Resin-bonded fixed partial denture (RBFPD)
Age Range	8 – 25 years
Location	Central or lateral incisor region
Number of teeth	Single-tooth replacement
Treatment time	Initial exam – 6 months post-operatively
Fees	National means

RESULTS

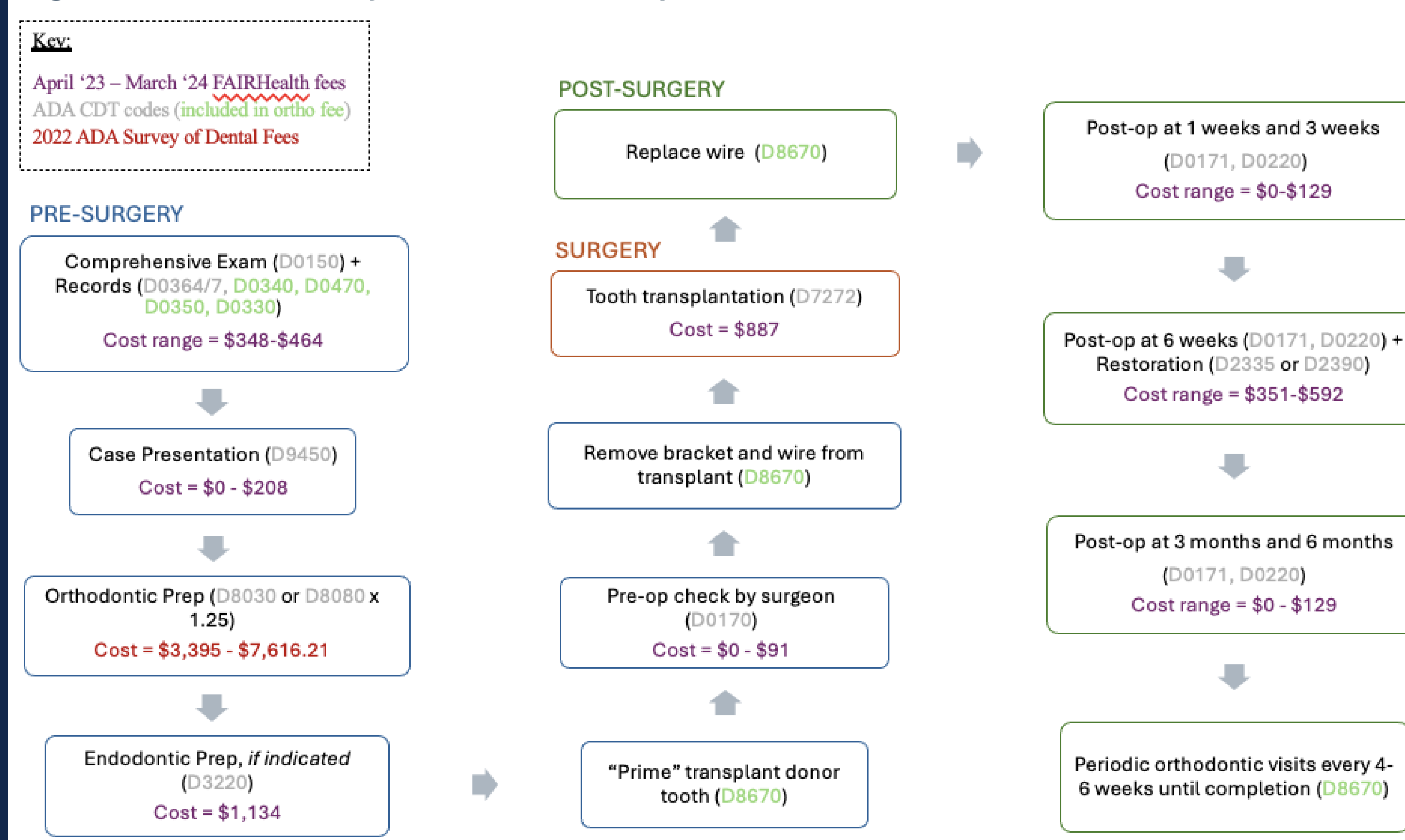### Figure 3: Clinical Pathway for Tooth Autotransplantation

Key:
April '23 – March '24 FAIRHealth fees
ADA CDT codes (included in ortho fee)
2022 ADA Survey of Dental Fees

PRE-SURGERY

Comprehensive Exam (D0150) + Records (D0364/7, D0340, D0470, D0350, D0330)
Cost range = $348-$464

Case Presentation (D9450)
Cost = $0 - $208

Orthodontic Prep (D8030 or D8080 x 1.25)
Cost = $3,395 - $7,616.21

Endodontic Prep, if indicated (D3220)
Cost = $1,134

SURGERY

Tooth transplantation (D7272)
Cost = $887

Remove bracket and wire from transplant (D8670)

Pre-op check by surgeon (D0170)
Cost = $0 - $91

"Prime" transplant donor tooth (D8670)

POST-SURGERY

Replace wire (D8670)

Post-op at 1 weeks and 3 weeks (D0171, D0220)
Cost range = $0-$129

Post-op at 6 weeks (D0171, D0220) + Restoration (D2335 or D2390)
Cost range = $351-$592

Post-op at 3 months and 6 months (D0171, D0220)
Cost range = $0 - $129

Periodic orthodontic visits every 4-6 weeks until completion (D8670)

RESULTS (CONT.)

Table 2: Procedure Costs For Each Treatment Option

MEAN COST	TREATMENT OPTION					
	TA w/ limited ortho	TA w/ comprehensive ortho	IP w/out ortho	IP w/ comprehensive ortho	RBFPD	OSC
Lowest	$4,981	$9,202	$5,657	$11,750	$3,093	$8,315
Highest	$7,287	$11,508	$12,714	$18,807	$5,816	$10,274
Total Mean	$6,134	$10,355	$9,186	$15,279	4,455	$9,295

Figure 4: Cost Comparisons of Autotransplantation (TA) and Implant-Supported Prosthesis (IP)
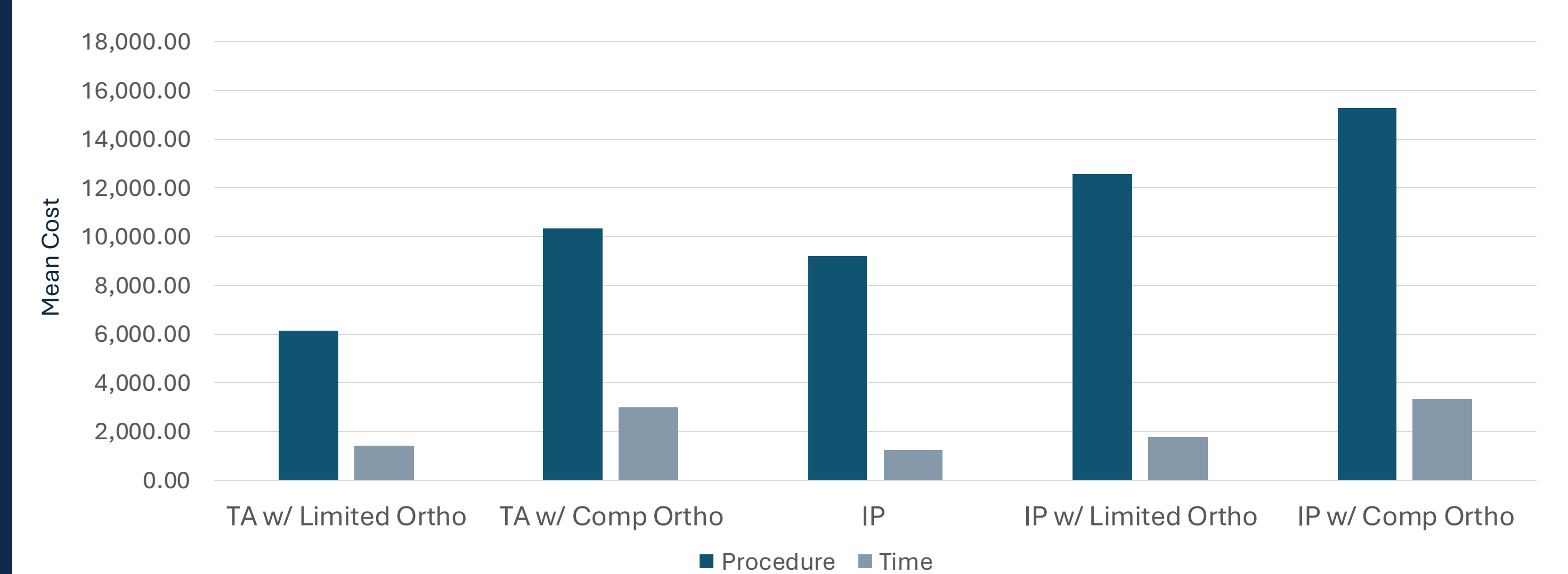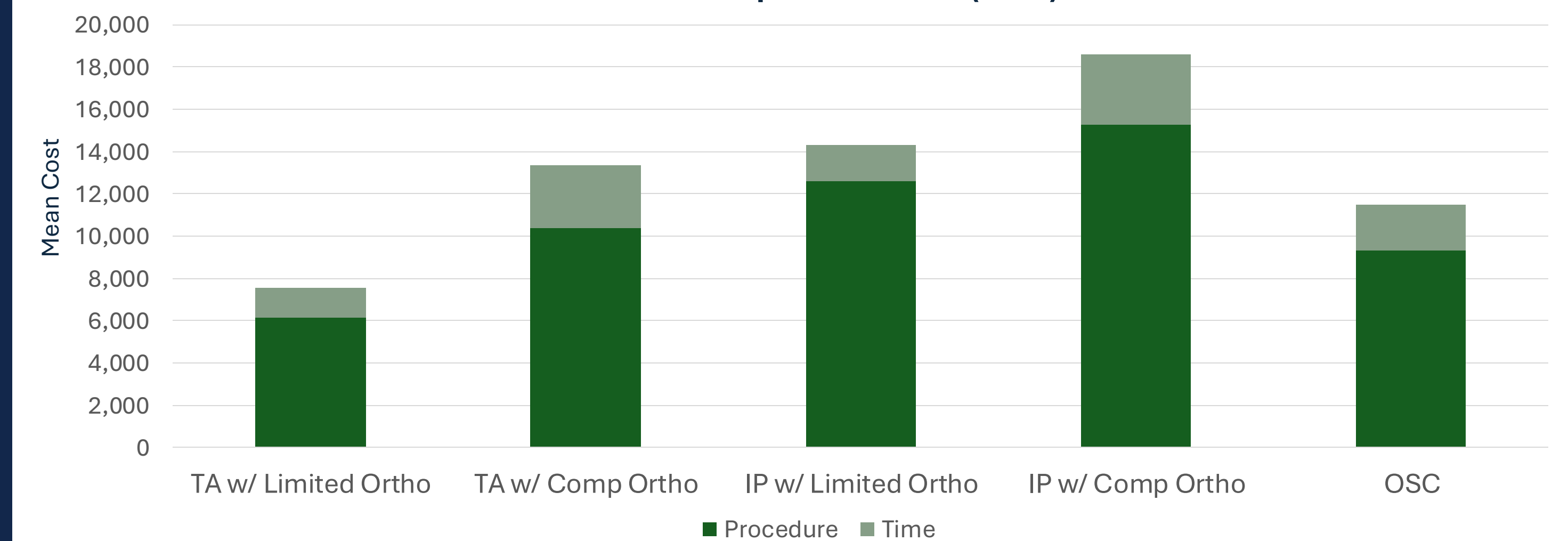

Figure 5: Cost Comparisons of Autotransplantation (TA), Implant-Supported Prosthesis (IP) and Orthodontic Space Closure (OSC)

CONCLUSIONS

Tooth autotransplantation is a practical tooth replacement option for families and one that should be considered by dental professionals when presented with a pediatric patient who needs tooth replacement in the maxillary anterior region. Costs are variable and further research is needed to expand our knowledge of the economic implications of tooth autotransplantation within the U.S. dental community.

REFERENCES AND ACKNOWLEDGEMENTS