

Defining Orthoplastic Limb Salvage Centers: A Systematic Review

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INTRODUCTION: Limb salvage centers have increased over time and lack standardized defining criteria, creating variations in care quality and outcomes across institutions. This systematic review aims to assess the characteristic features of limb salvage centers and determine whether orthoplastic centers represent a distinct care model to enable standardization frameworks.

METHODS: We conducted a systematic review following PRISMA guidelines, searching MEDLINE, Embase, Web of Science, and Cochrane databases from inception through 2024. Studies describing limb salvage care, clinical decision-making protocols, or organizational features were included. Binary data extraction focused on 26 organizational features classified across six structural care domains: team organization, care pathways, care delivery, outcome metrics, quality and safety, and network integration, with individual domain and total score (0-26 points) quantified for each paper. This allowed for the identification of characterizing features and differentiation of center types. Statistical comparisons between center types were performed using appropriate tests ($p < 0.05$). Risk of bias assessment was conducted using PRISMA guidelines.

RESULTS: 118 studies encompassing diverse limb salvage models were included. Orthoplastic ($n=43$) and vascular ($n=48$) centers were most common, representing 77.0% of all studies. Publication analysis showed a 32.5-fold increase from 2 studies pre-2005 to 65 studies in 2020-2024, with orthoplastic centers increasing from zero to 51% of recent publications. Orthoplastic centers achieved significantly higher total domain scores compared to vascular centers (median 13 vs 9 out of 26 points, $p < 0.001$). Statistical score comparison with vascular centers revealed ten significantly different features (*Table 1*), with orthoplastic centers showing superior implementation in: plastic reconstructive surgery (PRS) integration protocols (88-74% vs 33%-17%, $p < 0.001$), surgical timing metrics (44% vs 8-2%, $p < 0.001$), adverse event tracking (67% vs 25%, $p < 0.001$), centralized care models (81% vs 54%, $p = 0.006$), and trauma network participation (37% vs 4%, $p < 0.001$). Vascular centers demonstrated superior team composition documentation (94% vs 65%, $p < 0.001$) and quality metrics implementation (90% vs 72%, $p = 0.033$), reflecting established documentation frameworks for medical management teams (98% vascular surgeons + 71% podiatrists) focused on chronic disease management. In contrast, orthoplastic centers used acute bi-specialty reconstruction (PRS surgery 88% + orthopedic surgery 91%), with rehabilitative services. Six core defining features demonstrated >70% reporting prevalence: standardized protocols (91%), PRS indications and timing (89% and 74%), centralized care (81%), injury severity scoring, and quality metrics (72% each). Individual study analysis revealed substantial score variability, with orthoplastic centers ranging from 19% to 65% implementation rates and vascular centers from 4% to 54%, indicating inconsistent organizational development regardless of center designation. High-performing centers demonstrated national guideline integration, achieving 65% implementation rates, demonstrating achievable excellence through structured frameworks.

DISCUSSION AND CONCLUSION: Orthoplastic and vascular limb salvage centers represent statistically distinct care paradigms, with orthoplastic centers achieving higher scores in 8/10 significantly different organizational features. These findings support the development of evidence-based specialized frameworks for each center type to address documented organizational inconsistencies, highlighting PRS integration protocols, outcome measurement systems, centralized network integrations, and quality metrics as priorities that could enhance care delivery standardization.

Domains & Features	Orthopedic (n=43)	Vascular (n=48)	Difference	p-value
D1: Team & Organization (3)				
Team Composition Documented	28 (65%)	45 (94%)	-29%	<0.001
Multidisciplinary Meetings	15 (35%)	22 (46%)	-11%	0.29
Research Team	11 (26%)	20 (42%)	-16%	0.11
D2: Care Pathways (4)				
Transfer Protocols	28 (65%)	18 (38%)	+27%	0.009
Severity Scoring	31 (72%)	33 (69%)	+3%	0.73
Indications for PRS Consult	38 (88%)	16 (33%)	+55%	<0.001
Time to PRS Consultation	32 (74%)	8 (17%)	+57%	<0.001
D3: Care Delivery (4)				
Emergency Response Protocol	18 (42%)	13 (27%)	+15%	0.14
Treatment Algorithm	10 (23%)	13 (27%)	-4%	0.67
Standardized Protocols	39 (91%)	43 (90%)	+1%	0.86
Socioeconomic Disparity Measures	4 (9%)	4 (8%)	+1%	0.87
D4: Outcome Metrics (6)				
Time to Definitive Treatment	19 (44%)	4 (8%)	+36%	<0.001
Time to Coverage	19 (44%)	1 (2%)	+42%	<0.001
Psychological Assessment	8 (19%)	4 (8%)	+11%	0.15
Functional Assessment	21 (49%)	16 (33%)	+16%	0.13
Follow-up Protocols	21 (49%)	16 (33%)	+16%	0.13
Long-term Complication Monitoring	26 (60%)	27 (56%)	+4%	0.68
D5: Quality & Safety (5)				
Case Audit Frequency	4 (9%)	2 (4%)	+5%	0.32
Quality Metrics	31 (72%)	43 (90%)	-18%	0.033
Morbidity/Mortality Reviews	3 (7%)	2 (4%)	+3%	0.56
Adverse Event Tracking	29 (67%)	12 (25%)	+42%	<0.001
External Certification	2 (5%)	2 (4%)	+1%	0.91
D6: Network Integration (4)				
Centralized Care	35 (81%)	26 (54%)	+27%	0.006
Trauma Network Participation	16 (37%)	2 (4%)	+33%	<0.001
National Limb Salvage Registry	4 (9%)	5 (10%)	-1%	0.86
National Policy Compliance	22 (51%)	17 (35%)	+16%	0.13
Total Score				
Total Domain Score, median (IQR)	13 (10, 15)	9 (7, 11)	+3 points	<0.001

Table 1. Statistical Comparison of Organizational Features Between Orthopedic and Vascular Centers
 Comprehensive analysis of 26 structural elements across six domains comparing orthopedic (n=43) and vascular (n=48) centers. Ten elements showed statistically significant differences (p<0.05), with orthopedic centers demonstrating superiority in care pathways (PRS integration), timing metrics, and network integration, while vascular centers excelled in team documentation and quality metrics reporting.