Interprofessional Collaboration Between Physical Therapists, Occupational Therapists, and Prosthetist-Orthotists in Post-Amputation Rehabilitation: Evidence from Saudi Healthcare Settings

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Abstract
Interprofessional collaboration has been increasingly recognized as essential for optimizing rehabilitation outcomes following lower limb amputation. This literature review synthesizes evidence on collaborative practice among physical therapists, occupational therapists, and prosthetist-orthotists in post-amputation rehabilitation, with particular attention to the Saudi Arabian healthcare context. A comprehensive review of peer-reviewed literature reveals that effective interprofessional teamwork contributes to improved functional outcomes, enhanced prosthetic acceptance, and superior quality of life for individuals with limb loss. Physical therapists primarily address mobility, strength, and gait training; occupational therapists focus on activities of daily living and psychosocial adaptation; while prosthetist-orthotists ensure optimal prosthetic fit and function. In Saudi Arabia, interprofessional collaboration faces unique challenges including hierarchical professional structures, limited interprofessional education, and communication barriers. However, emerging evidence suggests growing recognition of collaborative care models. This review identifies critical gaps in research specific to Gulf healthcare systems and emphasizes the need for culturally adapted interprofessional frameworks, standardized outcome measures, and systematic implementation of team-based care protocols in Saudi rehabilitation settings.
Keywords: interprofessional collaboration, amputation rehabilitation, physical therapy, occupational therapy, prosthetics and orthotics, Saudi Arabia

1. INTRODUCTION

Lower limb amputation represents a life-altering event with profound physical, psychological, and social consequences that necessitate comprehensive rehabilitation interventions (Webster et al., 2019). The complexity of post-amputation rehabilitation demands coordinated efforts from multiple healthcare professionals, each contributing specialized expertise toward the common goal of maximizing functional independence and quality of life (Esquenazi & DiGiacomo, 2014). Interprofessional collaboration, defined as the process by which professionals from different disciplines work together to provide comprehensive care, has emerged as a critical component of effective amputation rehabilitation (Reeves et al., 2017).

The global burden of limb loss continues to rise, driven primarily by vascular disease and diabetes mellitus complications (Sahu et al., 2016). In Saudi Arabia specifically, diabetes-

related lower extremity amputations have reached alarming proportions, with prevalence rates significantly exceeding international averages (Alzahrani et al., 2019; Alzahrani et al., 2020). This epidemiological reality underscores the urgent need for optimized rehabilitation services that can effectively address the multifaceted needs of individuals with limb loss.

Traditional rehabilitation approaches have evolved from siloed, profession-specific interventions toward integrated, team-based models that recognize the interconnected nature of physical, functional, and psychosocial recovery (Dillingham et al., 2005). Physical therapists, occupational therapists, and prosthetist-orthotists constitute the core rehabilitation team for individuals with lower limb amputation, each bringing distinct yet complementary competencies (Highsmith et al., 2016). Despite theoretical recognition of collaborative practice benefits, substantial gaps persist between ideal interprofessional models and actual clinical implementation, particularly in emerging healthcare systems.

The Saudi Arabian healthcare context presents unique considerations for interprofessional collaboration. Recent investigations have identified both cultural and systemic factors that influence teamwork effectiveness in Saudi healthcare settings (Alharbi et al., 2014; Alshahrani & Baharoon, 2020). Hierarchical professional structures, variable interprofessional education exposure, and communication challenges have been documented as barriers to collaborative practice (Almutairi et al., 2018). Simultaneously, Saudi Arabia's Vision 2030 healthcare transformation initiatives emphasize quality improvement and patient-centered care, creating opportunities for enhanced interprofessional collaboration models (Alshammari et al., 2016).

While extensive literature examines amputation rehabilitation in Western healthcare contexts, evidence specific to Gulf Cooperation Council countries remains limited (Magnusson et al., 2019). This geographical research gap is particularly problematic given substantial differences in healthcare delivery systems, cultural norms regarding disability, family involvement in care, and resource availability that may fundamentally influence collaborative practice patterns and rehabilitation outcomes.

The objective of this review is to synthesize existing evidence on interprofessional collaboration among physical therapists, occupational therapists, and prosthetist-orthotists in post-amputation rehabilitation, with specific attention to applicability and evidence from Saudi healthcare settings. This review examines the theoretical foundations of collaborative practice, delineates profession-specific roles, evaluates evidence for collaboration effectiveness, identifies contextual factors relevant to Saudi Arabia, and proposes directions for research and practice enhancement.

2. LITERATURE REVIEW

2.1 Theoretical Foundations of Interprofessional Collaboration in Rehabilitation

Interprofessional collaboration represents a distinct practice model characterized by shared decision-making, collective accountability, and integrated care delivery (Reeves et al., 2017). The theoretical underpinnings of collaborative practice emerge from systems theory, which conceptualizes healthcare teams as dynamic systems wherein interaction patterns among professionals directly influence patient outcomes (Lemieux-Charles & McGuire, 2006). Within rehabilitation contexts, interprofessional collaboration transcends simple coordination of services; it involves substantive integration of assessment data, treatment planning, and outcome evaluation across professional boundaries (Strasser et al., 2005).

The Cochrane systematic review by Reeves et al. (2017) provided robust evidence that practice-based interprofessional collaboration interventions improve both professional practice behaviors and healthcare outcomes. These findings establish that collaborative practice constitutes an evidence-based approach rather than merely an aspirational ideal.

Hammick et al. (2007) identified interprofessional education as foundational for developing collaborative competencies, emphasizing that effective teamwork requires deliberate cultivation of shared knowledge, mutual respect, and communication skills.

In amputation rehabilitation specifically, theoretical models emphasize the biopsychosocial framework articulated through the International Classification of Functioning, Disability and Health (Gallagher et al., 2010). This framework explicitly recognizes that successful rehabilitation outcomes depend upon addressing not only body functions and structures but also activity participation and contextual factors, necessitating integrated expertise from multiple disciplines (Webster et al., 2019).

2.2 Professional Roles in Post-Amputation Rehabilitation

The interdependence of professional roles in amputation rehabilitation reflects the multidimensional nature of recovery challenges. Physical therapists assume primary responsibility for preprosthetic and prosthetic gait training, strength and endurance conditioning, balance enhancement, and pain management (Gailey et al., 2014). Evidence demonstrates that systematic physical therapy interventions significantly improve mobility outcomes, reduce fall risk, and facilitate prosthetic acceptance (Geertzen et al., 2015). Gailey et al. (2014) detailed comprehensive physical therapy protocols spanning preprosthetic strengthening, early mobilization, progressive gait training, and advanced functional activities, establishing physical therapy as central to physical restoration.

Occupational therapists contribute specialized expertise in activities of daily living retraining, psychosocial adaptation facilitation, home and workplace modification, and cognitive-behavioral interventions addressing body image and adjustment (American Occupational Therapy Association, 2020). While occupational therapy's role in amputation rehabilitation has received less research attention than physical therapy, evidence from related populations demonstrates significant contributions to functional independence and quality of life (Legg et al., 2017). The occupational therapy practice framework emphasizes occupation-based interventions that address meaningful life roles, a perspective particularly valuable for individuals reconstructing identity and function following limb loss (American Occupational Therapy Association, 2020).

Prosthetist-orthotists provide essential expertise in prosthetic prescription, fabrication, fitting, and adjustment (Mâsse & Lamontagne, 2014). The prosthetist's role extends beyond technical device provision to encompass patient education, socket modification, alignment optimization, and long-term prosthetic management (Hanspal et al., 2003). Research indicates that prosthetic socket comfort and fit directly influence functional outcomes and prosthetic acceptance, underscoring the critical importance of prosthetist expertise (Hanspal et al., 2003; Fleury et al., 2013).

Critically, these professional roles are not discrete but rather overlapping and interdependent. Optimal gait training requires coordination between physical therapists addressing movement patterns and prosthetists ensuring appropriate prosthetic alignment (Mâsse & Lamontagne, 2014). Activities of daily living training conducted by occupational therapists must account for prosthetic capabilities and limitations identified by prosthetists. Pain management strategies implemented by physical therapists depend upon occupational therapists addressing psychosocial factors and prosthetists ensuring socket comfort.

2.3 Evidence for Interprofessional Collaboration Effectiveness

Empirical evidence supporting interprofessional collaboration in amputation rehabilitation derives primarily from observational studies and systematic reviews. The seminal work by Dillingham et al. (2005) established that team-based approaches correlate with superior functional outcomes compared with fragmented care delivery. Raya et al. (2010) conducted an extensive literature review identifying multidisciplinary team involvement as a consistent predictor of successful prosthetic rehabilitation across diverse patient populations.

Highsmith et al. (2016) performed a scoping review specifically examining interprofessional collaboration in prosthetic rehabilitation, revealing that while collaborative practice is widely endorsed theoretically, empirical research quantifying collaboration processes and outcomes remains limited. Their review identified substantial heterogeneity in how collaboration is operationalized and measured across studies, complicating efforts to synthesize evidence systematically.

Systematic reviews of rehabilitation interventions consistently identify team composition and communication quality as moderating variables influencing outcome achievement (Sansam et al., 2015; Norvell et al., 2011). Traballesi et al. (2007) found that access to comprehensive multidisciplinary rehabilitation services predicted successful prosthetic use following major lower extremity amputation. Conversely, fragmented care delivery characterized by poor communication and unclear role delineation was associated with prosthetic abandonment and reduced functional independence (Fleury et al., 2013).

Research examining specific interprofessional processes has demonstrated that structured team meetings, shared documentation systems, and collaborative goal-setting enhance care coordination and patient satisfaction (Strasser et al., 2002). Lemieux-Charles and McGuire (2006) developed validated measures of team functioning in healthcare settings, providing methodological tools for investigating collaboration's effects. However, application of such measures specifically within amputation rehabilitation teams remains rare in published literature.

2.4 Outcomes Associated with Collaborative Amputation Rehabilitation

Rehabilitation outcomes following lower limb amputation encompass multiple domains including mobility, activities of daily living independence, prosthetic acceptance and use, pain management, psychological adjustment, and health-related quality of life (Gallagher et al., 2010; Condie et al., 2006). Evidence suggests that coordinated interprofessional interventions positively influence outcomes across these domains, though effect sizes vary and methodological limitations constrain definitive conclusions.

Mobility and functional outcomes represent the most extensively researched domain. Systematic reviews demonstrate that individuals receiving comprehensive team-based rehabilitation achieve superior mobility outcomes measured through validated instruments including the Locomotor Capabilities Index and Timed Up and Go test (Rommers et al., 1997; Geertzen et al., 2015). Esquenazi and DiGiacomo (2014) reported that multidisciplinary rehabilitation protocols resulted in 85% of younger traumatic amputees and 60% of older dysvascular amputees achieving independent community ambulation, substantially exceeding historical benchmarks.

Prosthetic acceptance and sustained use constitute critical outcomes given high rates of prosthetic abandonment documented in some populations (Sansam et al., 2015). Research indicates that coordinated involvement of physical therapists addressing functional training, occupational therapists facilitating psychosocial adaptation, and prosthetists ensuring optimal fit collectively enhance prosthetic acceptance (Fleury et al., 2013). Conversely, inadequate coordination among these professionals, particularly delays in addressing socket discomfort or unrealistic functional expectations, contributes to prosthetic rejection (Desmond & Gallagher, 2008).

Psychosocial outcomes including depression, anxiety, body image concerns, and social participation have received increasing research attention (Sahu et al., 2016). While occupational therapists possess specialized competencies in psychosocial intervention, evidence suggests that comprehensive team approaches addressing both physical and psychological dimensions produce superior psychosocial outcomes compared with isolated psychological interventions (Webster et al., 2019). The interrelationship between physical

recovery, functional achievement, and psychological adjustment underscores the necessity of integrated interprofessional approaches.

Health-related quality of life represents an integrative outcome encompassing physical, psychological, and social dimensions (Simons & Bradbury, 2008). Research consistently demonstrates that individuals receiving coordinated multidisciplinary rehabilitation report higher quality of life compared with those receiving fragmented services (Sahu et al., 2016; Pezzin et al., 2000). Davie-Smith et al. (2017) found that quality of life outcomes were significantly influenced by the comprehensiveness of rehabilitation team involvement and quality of interprofessional communication.

2.5 Interprofessional Collaboration in Saudi Healthcare Context

Understanding interprofessional collaboration in Saudi Arabian amputation rehabilitation requires consideration of broader patterns characterizing Saudi healthcare systems. Recent research has begun elucidating both barriers and facilitators to collaborative practice in Saudi settings, revealing a complex landscape shaped by cultural, organizational, and educational factors.

Aldriwesh et al. (2021) investigated Saudi medical students' perspectives on interprofessional education and collaboration, finding generally positive attitudes but limited exposure to structured interprofessional learning experiences. This educational gap potentially constrains collaborative competency development, with implications for subsequent clinical practice patterns. Similarly, Alshahrani and Alenezi (2019) documented that while Saudi healthcare students endorsed interprofessional collaboration conceptually, they possessed limited understanding of other professions' roles and scopes of practice.

Empirical investigations of practicing healthcare professionals in Saudi Arabia have identified significant barriers to interprofessional collaboration. Almutairi et al. (2018) conducted a cross-sectional study of primary healthcare settings, revealing that hierarchical professional relationships, unclear role definitions, and inadequate communication mechanisms substantially impeded collaborative practice. Alshahrani and Baharoon (2020) performed qualitative interviews with Saudi healthcare professionals, identifying additional barriers including time constraints, workload pressures, lack of institutional support for teamwork, and traditional professional boundaries.

Conversely, facilitators of interprofessional collaboration identified in Saudi research include strong motivation to improve patient care quality, recognition of care complexity necessitating teamwork, and positive previous collaboration experiences (Alshahrani & Baharoon, 2021). Alharbi et al. (2014) found that Saudi rehabilitation professionals expressed strong commitment to team-based care despite acknowledging substantial implementation challenges. These findings suggest receptivity to enhanced collaboration models provided that systemic barriers are addressed.

Alquwez et al. (2020) examined perceptions of interprofessional collaboration among diverse healthcare professionals in Saudi hospitals, documenting significant variation across professional groups and institutional contexts. Nurses and allied health professionals reported less favorable collaboration experiences compared with physicians, suggesting power differentials influence collaborative practice patterns. These findings align with broader literature on interprofessional dynamics in healthcare systems characterized by traditional professional hierarchies (Schot et al., 2020).

Specific to rehabilitation services, Alshammari et al. (2016) reviewed rehabilitation literature in Saudi Arabia, identifying critical gaps in research, variability in service quality and availability, and limited integration of evidence-based interprofessional models. Their review revealed that rehabilitation services in Saudi Arabia remain underdeveloped relative to acute care services, with particular deficiencies in community-based and long-term

rehabilitation programs. This structural limitation directly constrains opportunities for sustained interprofessional collaboration in post-amputation rehabilitation.

2.6 Barriers and Facilitators to Interprofessional Collaboration

Synthesis of evidence from both international and Saudi-specific literature reveals common themes regarding factors influencing interprofessional collaboration effectiveness. Barriers consistently identified across contexts include professional territoriality, status hierarchies, communication deficiencies, role ambiguity, time constraints, and inadequate organizational support (Sollid et al., 2015; Schot et al., 2020).

Professional territoriality, characterized by rigid adherence to traditional scope of practice boundaries and resistance to role flexibility, impedes the fluid collaboration required in complex rehabilitation cases (Körner et al., 2015). Status hierarchies that privilege certain professions over others create power imbalances that inhibit equal participation in team decision-making (Foronda et al., 2016). These hierarchical patterns appear particularly pronounced in healthcare systems with traditional professional structures, potentially including Saudi Arabian settings (Alshahrani & Baharoon, 2020).

Communication deficiencies represent pervasive barriers manifesting in multiple forms including inadequate information sharing, lack of structured team meetings, incompatible documentation systems, and physical separation of professionals (Suddick & O'Neill, 2009). In amputation rehabilitation specifically, communication failures between physical therapists and prosthetists regarding gait deviations or between occupational therapists and prosthetists regarding functional limitations can substantially compromise rehabilitation effectiveness (Highsmith et al., 2016).

Facilitators of effective interprofessional collaboration include shared goals and vision, mutual respect and trust, clear role definitions with flexible boundaries, structured communication mechanisms, organizational support for teamwork, interprofessional education, and positive collaboration experiences (Reeves et al., 2017; Strasser et al., 2005). Meier (2014) emphasized the critical role of rehabilitation team leadership in establishing collaborative culture, facilitating communication, and coordinating care delivery.

In amputation rehabilitation teams specifically, shared patient-centered goals appear particularly powerful in motivating collaborative practice (Highsmith et al., 2016). When professionals collectively focus on maximizing the patient's functional independence and quality of life rather than profession-specific objectives, collaborative behaviors increase substantially (Esquenazi & DiGiacomo, 2014).

3. METHODS

This review employed a systematic approach to synthesize existing evidence on interprofessional collaboration in post-amputation rehabilitation with attention to Saudi Arabian healthcare contexts. The methodological framework incorporated principles from established systematic review guidelines while accommodating the specific objectives of examining both general collaboration evidence and context-specific implementation factors.

A comprehensive literature search was conducted across multiple databases including PubMed, Scopus, Web of Science, and Cochrane Library. Search strategies utilized controlled vocabulary terms and keywords related to interprofessional collaboration, interdisciplinary teams, multidisciplinary rehabilitation, amputation, prosthetics, physical therapy, occupational therapy, prosthetist-orthotist, and Saudi Arabia. The search encompassed publications from 1997 through 2021 to capture seminal foundational research and recent developments.

Inclusion criteria specified peer-reviewed journal articles, systematic reviews, and meta-analyses published in English that addressed interprofessional or multidisciplinary collaboration in amputation rehabilitation or provided relevant evidence on collaborative practice in Saudi healthcare settings. Studies focusing exclusively on surgical techniques or medical management without rehabilitation components were excluded. Both empirical research studies and theoretical or conceptual papers were included to provide comprehensive coverage.

Evidence synthesis followed a narrative approach organized by thematic categories including theoretical foundations, professional roles, collaboration effectiveness, outcomes, and contextual factors. This approach was selected as more appropriate than quantitative meta-analysis given the heterogeneity of study designs, outcome measures, and populations represented in the literature. Critical appraisal of evidence quality considered study design rigor, sample characteristics, measurement validity, and generalizability of findings.

The synthesis specifically sought to identify evidence directly applicable to Saudi Arabian contexts while recognizing that much existing research derives from Western healthcare systems. Careful attention was directed toward examining how cultural, organizational, and systemic factors might influence the transferability of findings across healthcare contexts. Gaps in evidence specific to Gulf Cooperation Council countries were explicitly noted to guide future research priorities.

4. RESULTS

4.1 Synthesis of Evidence on Interprofessional Collaboration Models

The literature review identified multiple models of interprofessional collaboration employed in amputation rehabilitation settings, varying in structure, intensity, and theoretical orientation. The most commonly described model involves a core rehabilitation team comprising physical therapists, occupational therapists, and prosthetist-orthotists, often with additional involvement from rehabilitation physicians, nurses, psychologists, and social workers (Esquenazi & DiGiacomo, 2014; Meier, 2014). This expanded team configuration reflects recognition of the multifaceted needs characterizing post-amputation recovery.

Evidence synthesis revealed that effective collaboration models share common structural elements including regular team meetings with case conferencing, shared documentation systems enabling information exchange, collaborative goal-setting involving both professionals and patients, clearly defined yet flexible professional roles, and designated team coordination mechanisms (Strasser et al., 2002; Dillingham et al., 2005). The presence of these structural elements distinguished higher-functioning teams from those characterized by parallel rather than integrated practice patterns.

Temporal sequencing of professional involvement emerged as an important consideration. Optimal rehabilitation trajectories involve prosthetist engagement during preprosthetic phases for early assessment and planning, coordinated physical therapy and occupational therapy throughout preprosthetic and prosthetic phases, and sustained prosthetist involvement for fitting and adjustment concurrent with functional training (Mâsse & Lamontagne, 2014). Delays in prosthetist involvement or premature discharge of therapy services were identified as common coordination failures compromising outcomes.

Table 1 presents a synthesis of core professional roles and collaborative touchpoints in post-amputation rehabilitation based on evidence from reviewed literature.

Table 1.Professional Roles and Interprofessional Collaboration Points in Post-Amputation Rehabilitation

Professional	Primary Role Components	Critical Collaboration Points
Physical Therapist	Preprosthetic conditioning; strength, flexibility, balance training; gait analysis and training; pain management; cardiovascular conditioning	Coordination with prosthetist on gait deviations and alignment; collaboration with OT on transfer training and mobility during ADLs; communication with prosthetist regarding patient tolerance and progression
Occupational Therapist	Activities of daily living training; psychosocial adaptation support; home/workplace modification assessment; cognitive-behavioral interventions; body image counseling; community reintegration	Integration of prosthetic training into functional activities; collaboration with PT on transfer techniques; coordination with prosthetist on ADL-specific prosthetic needs; family education and support
Prosthetist-Orthotist	Prosthetic evaluation and prescription; fabrication and fitting; socket modification; alignment optimization; component selection; patient education on care and maintenance	Feedback integration from PT and OT on functional performance; collaborative problem-solving for fit and function issues; joint patient education sessions; adjustment scheduling coordinated with therapy

Note. ADL = Activities of Daily Living; OT = Occupational Therapist; PT = Physical Therapist. Synthesized from Esquenazi & DiGiacomo (2014), Gailey et al. (2014), Mâsse & Lamontagne (2014), and American Occupational Therapy Association (2020).

4.2 Outcomes Evidence

Synthesis of outcome evidence revealed generally positive associations between interprofessional collaboration quality and rehabilitation outcomes, though methodological heterogeneity limits definitive conclusions. Studies employing validated outcome measures documented that coordinated team care correlates with superior functional mobility, higher rates of prosthetic acceptance and sustained use, better psychosocial adjustment, and enhanced health-related quality of life compared with fragmented care delivery (Rommers et al., 1997; Norvell et al., 2011; Webster et al., 2019).

Quantitative findings from systematic reviews indicate that comprehensive team-based rehabilitation programs achieve community ambulation rates of 60-85% depending on patient population characteristics, substantially exceeding outcomes associated with limited or single-discipline interventions (Sansam et al., 2015; Geertzen et al., 2015). Prosthetic acceptance rates similarly demonstrate positive associations with team care comprehensiveness and coordination quality (Fleury et al., 2013).

However, evidence directly measuring collaboration processes and linking these to outcomes remains limited. Most studies infer collaboration quality from team composition or care setting rather than employing validated collaboration measures (Highsmith et al.,

2016). This measurement gap represents a critical limitation constraining conclusions about causal relationships between specific collaborative practices and patient outcomes.

4.3 Evidence from Saudi Healthcare Settings

Literature specifically addressing amputation rehabilitation in Saudi Arabia revealed significant gaps. While epidemiological studies document high amputation incidence related to diabetes complications (Alzahrani et al., 2019; Alzahrani et al., 2020), peer-reviewed research examining rehabilitation service delivery, interprofessional collaboration patterns, or rehabilitation outcomes in Saudi settings remains extremely limited.

Available evidence on interprofessional collaboration in Saudi healthcare more broadly reveals a developing but not yet fully mature collaborative practice environment. Studies document positive attitudes toward collaboration among healthcare professionals but identify substantial implementation barriers including hierarchical structures, communication challenges, and limited interprofessional education (Almutairi et al., 2018; Alshahrani & Baharoon, 2020; Aldriwesh et al., 2021).

Table 2 summarizes key findings from research examining interprofessional collaboration factors in Saudi healthcare contexts.

Table 2.Barriers and Facilitators to Interprofessional Collaboration in Saudi Healthcare Settings

Category	Identified Barriers	Identified Facilitators
Educational	Limited interprofessional education exposure; insufficient understanding of other professions' roles; traditional profession-specific training models	Growing recognition of IPE importance; positive student attitudes toward collaboration; emerging IPE initiatives in some institutions
Organizational	Hierarchical professional structures; inadequate time for team meetings; physical separation of professionals; lack of institutional collaboration policies	Institutional quality improvement initiatives; Vision 2030 healthcare transformation goals; patient safety emphasis driving teamwork
Professional	Professional territoriality and boundary protection; status differentials between professions; unclear role definitions; communication gaps	Strong commitment to patient care quality; recognition of complex patient needs; positive previous collaboration experiences; patient-centered care values
Cultural	Traditional hierarchical social structures; gender-related interaction constraints; preference for clear authority lines	Collective culture valuing group harmony; family-centered care traditions; Islamic values emphasizing compassionate care

Note. IPE = Interprofessional Education. Synthesized from Almutairi et al. (2018), Alshahrani & Baharoon (2020), Aldriwesh et al. (2021), Alshahrani & Baharoon (2021), Alquwez et al. (2020), and Alharbi et al. (2014).

4.4 Gaps in Evidence

Critical gaps identified through this review include: (a) absence of published research specifically examining interprofessional collaboration in Saudi amputation rehabilitation settings; (b) limited evidence directly measuring collaboration processes using validated instruments; (c) insufficient research examining mechanisms linking specific collaborative practices to particular outcomes; (d) lack of studies comparing different collaboration models within amputation rehabilitation; (e) limited investigation of patient and family perspectives on interprofessional collaboration; and (f) absence of research on culturally adapted collaboration models appropriate for Gulf healthcare contexts.

These evidence gaps substantially constrain evidence-based implementation of interprofessional collaboration models in Saudi amputation rehabilitation. While general principles can be extrapolated from international literature, context-specific factors may fundamentally influence optimal collaboration structures and processes.

5. DISCUSSION

5.1 Integration of Findings

This review synthesized substantial evidence supporting interprofessional collaboration as a foundational component of effective post-amputation rehabilitation. The convergence of findings across multiple systematic reviews and primary studies establishes that coordinated team-based care, involving physical therapists, occupational therapists, and prosthetist-orthotists working in integrated partnership, produces superior outcomes compared with fragmented single-discipline approaches (Esquenazi & DiGiacomo, 2014; Webster et al., 2019; Reeves et al., 2017). This evidence base provides strong justification for prioritizing interprofessional collaboration model development and implementation in amputation rehabilitation services.

The delineation of professional roles reveals both distinct expertise domains and substantial interdependence requiring active coordination (Gailey et al., 2014; Mâsse & Lamontagne, 2014; American Occupational Therapy Association, 2020). Physical therapists' specialized competencies in movement analysis, gait training, and physical conditioning complement occupational therapists' expertise in functional activity integration, psychosocial adaptation, and occupational performance. Prosthetist-orthotists contribute essential technical knowledge ensuring optimal prosthetic prescription, fabrication, and modification. Critically, maximal rehabilitation effectiveness requires that these complementary competencies be integrated through structured collaboration rather than merely coordinated sequentially.

The Saudi Arabian healthcare context presents both challenges and opportunities for interprofessional collaboration enhancement in amputation rehabilitation. Documented barriers including hierarchical professional structures, limited interprofessional education exposure, and communication challenges (Almutairi et al., 2018; Alshahrani & Baharoon, 2020) suggest that simple transplantation of Western collaboration models may encounter implementation difficulties. However, identified facilitators including strong patient care commitment, recognition of complex care needs requiring teamwork, and healthcare transformation initiatives aligned with Vision 2030 (Alharbi et al., 2014; Alshahrani & Baharoon, 2021) suggest receptivity to evidence-based collaboration model implementation provided that contextual adaptation occurs.

5.2 Implications for Practice

The evidence synthesized in this review suggests several practice implications for Saudi amputation rehabilitation services. First, systematic implementation of structured interprofessional collaboration mechanisms including regular team meetings, shared

documentation systems, and collaborative care planning should be prioritized in facilities providing amputation rehabilitation (Strasser et al., 2002). These structural elements provide essential infrastructure supporting collaborative practice and have demonstrated associations with improved outcomes (Lemieux-Charles & McGuire, 2006).

Second, clarity regarding professional roles combined with intentional cultivation of role flexibility appears critical for effective collaboration (Körner et al., 2015). Rehabilitation teams benefit from explicit articulation of each profession's primary responsibilities while simultaneously developing shared competencies and flexible boundaries enabling responsive adaptation to individual patient needs. This balance between role clarity and flexibility may require particular attention in contexts characterized by traditional professional boundaries.

Third, prosthetist-orthotist integration throughout the rehabilitation trajectory rather than isolated involvement for fitting requires emphasis (Mâsse & Lamontagne, 2014; Highsmith et al., 2016). Evidence indicates that optimal outcomes emerge when prosthetist expertise informs preprosthetic planning, guides prosthetic prescription decisions in consultation with therapists and patients, and remains available for ongoing adjustment and problem-solving throughout functional training phases. This integrated involvement model may require service delivery restructuring in settings where prosthetist contact is traditionally limited to discrete fitting appointments.

Fourth, patient and family engagement in collaborative care processes should be prioritized. While professional-to-professional collaboration constitutes the focus of most literature, patient-centered care principles emphasize that individuals receiving rehabilitation and their families represent essential team members whose perspectives, goals, and preferences should fundamentally shape collaborative decision-making (Desmond & Gallagher, 2008). This patient engagement may align particularly well with family-centered care traditions prominent in Saudi culture.

5.3 Implications for Education

The documented relationship between interprofessional education exposure and subsequent collaborative practice effectiveness (Hammick et al., 2007) carries significant implications for rehabilitation professional education in Saudi Arabia. Current evidence indicates limited interprofessional education integration in Saudi health professions programs (Aldriwesh et al., 2021; Alshahrani & Alenezi, 2019), suggesting substantial opportunity for educational enhancement.

Development of interprofessional education curricula specific to amputation rehabilitation could provide students and early-career professionals with foundational knowledge of other professions' roles, collaborative competency development, and experiential learning in team-based care delivery. Such educational initiatives should extend beyond simple exposure to other professions toward substantive interprofessional learning experiences involving shared educational activities, collaborative problem-solving, and reflection on teamwork processes (Hammick et al., 2007).

Continuing professional development programs focused on interprofessional collaboration competencies may benefit practicing clinicians whose pre-licensure education lacked interprofessional components. These programs should address both collaboration knowledge and skills, incorporating experiential learning methodologies such as simulation, case-based learning, and facilitated team reflection (Reeves et al., 2017).

5.4 Research Directions

This review identified substantial research gaps that constrain evidence-based interprofessional collaboration implementation in Saudi amputation rehabilitation. Priority research directions include: (a) descriptive studies characterizing current interprofessional collaboration patterns, structures, and processes in Saudi amputation rehabilitation

settings; (b) development and validation of collaboration measurement instruments appropriate for Saudi healthcare contexts; (c) prospective studies examining relationships between collaboration quality and rehabilitation outcomes using validated measures of both collaboration and outcomes; (d) intervention research testing collaboration enhancement strategies adapted for Saudi organizational and cultural contexts; (e) qualitative investigations exploring patient, family, and professional perspectives on collaboration; and (f) health services research examining optimal team composition, intensity, and duration for different amputation populations.

Methodologically rigorous research addressing these priorities would substantially advance evidence-based practice while contributing to broader international literature that remains limited despite widespread theoretical endorsement of collaborative practice (Highsmith et al., 2016). Particular value would derive from research employing validated collaboration measures enabling examination of relationships between specific collaborative processes and particular outcomes, addressing a critical gap in existing literature.

Comparative effectiveness research examining different collaboration models could inform optimal service delivery structure decisions. For example, research comparing outcomes associated with co-located integrated teams versus distributed teams coordinating through electronic communication could guide facility planning and resource allocation decisions. Similarly, research examining optimal timing and intensity of different professionals' involvement across rehabilitation phases could enhance efficiency while maintaining outcome quality.

5.5 Limitations

This review possesses limitations that warrant acknowledgment. First, the narrative synthesis approach, while appropriate given literature heterogeneity, introduces potential subjective interpretation bias compared with quantitative meta-analysis. Second, the predominance of evidence from Western healthcare systems limits direct applicability to Saudi contexts, with cultural, organizational, and systemic differences potentially influencing collaboration patterns and effectiveness. Third, the limited availability of peer-reviewed research specifically examining amputation rehabilitation or interprofessional collaboration in Saudi Arabia constrained context-specific evidence synthesis.

Fourth, publication bias may result in overrepresentation of positive collaboration findings, with negative or null findings less likely to achieve publication. Fifth, the wide variation in how interprofessional collaboration is operationalized and measured across studies complicates comparison and synthesis. Sixth, most reviewed studies employed observational designs rather than randomized controlled trials, limiting causal inferences about collaboration effects on outcomes.

Despite these limitations, the synthesis provides valuable evidence supporting interprofessional collaboration's importance in amputation rehabilitation while highlighting critical knowledge gaps requiring research attention. The integration of general collaboration evidence with Saudi-specific healthcare literature offers a foundation for contextually informed collaboration model development and implementation.

5.6 Future Directions and Recommendations

Advancing interprofessional collaboration in Saudi amputation rehabilitation requires coordinated efforts across multiple levels. At the healthcare system level, policies supporting team-based care delivery, resource allocation enabling adequate staffing of rehabilitation teams, and electronic health record systems facilitating information sharing represent foundational requirements. Professional regulatory bodies should examine scope of practice regulations to ensure appropriate flexibility supporting collaborative practice while maintaining accountability.

Educational institutions should systematically integrate interprofessional education throughout rehabilitation professional curricula, providing students with collaboration competencies essential for contemporary practice. Clinical facilities should implement structured collaboration mechanisms including regular interdisciplinary team meetings, collaborative documentation, and joint treatment sessions where appropriate.

Research institutions and funding agencies should prioritize research addressing identified evidence gaps, particularly studies examining collaboration in Saudi and broader Gulf healthcare contexts. Development of research collaborations between Saudi institutions and international centers with established amputation rehabilitation research programs could accelerate evidence generation while ensuring cultural and contextual appropriateness.

Professional organizations representing physical therapy, occupational therapy, and prosthetics and orthotics should collaboratively develop interprofessional practice guidelines specific to amputation rehabilitation, adapted for Saudi healthcare contexts. These guidelines should articulate evidence-based collaboration structures, processes, and outcome expectations while providing practical implementation guidance.

Ultimately, translation of collaboration evidence into improved patient outcomes requires sustained commitment from individual professionals, healthcare organizations, educational institutions, professional bodies, and health system leadership. The substantial evidence supporting interprofessional collaboration's benefits, combined with recognition of barriers requiring deliberate attention, provides both motivation and direction for systematic collaboration enhancement in Saudi amputation rehabilitation services.

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