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# Quality of Life in Amputated Trauma Patients: A Systematic Review

Saleh Abdulkarim H. Khallaf*
*Lincoln University College, Petaling Jaya, Selangor, Malaysia*

***Abstract*: Background: Amputations for trauma patients included upper and lower limbs. The quality-of-life domains aimed to analyse a comprehensive approach to enhancing overall well-being among these patients. Methodology: The databases used were PubMed, ProQuest, and Google Scholar. The PRISMA guideline was used to eliminate other studies. The critical appraisal of studies used the CASP for qualitative research, NOS for cohort studies, and STROBE for cross-sectional studies to reveal strengths in methodology, data collection, and analysis. Results: Of the 110 records identified on databases, only 4 studies were used. The physical, financial, mental, and emotional domains were analyzed to achieve a quality of life in amputated trauma patients. Conclusion: Health promotion enhanced the domains of the quality of life. By integrating health promotion strategies with the four domains — physical, financial, mental, and emotional — new knowledge and practices was synthesized to foster holistic and sustainable health improvements among amputated trauma patients.**

***Keywords*: QOL and limb loss, amputation, QOL, amputated trauma patients.**

## 1. Introduction

Amputations for trauma patients included partial hand amputations, wrist disarticulation, below-the-elbow amputations, elbow disarticulation, above-the-elbow amputations, shoulder disarticulation, and forequarter amputations, as well as lower extremity amputations such as partial foot amputations, ankle disarticulation, below-the-knee amputations, knee disarticulation, above-the-knee amputations, hip disarticulation, and pelvic amputations (Al-Shenqiti, 2021; Puranik et al., 2021; Yammine et al., 2022). This systematic review aimed to analyse the quality of life (QOL) in amputated trauma patients.

In this systematic review, only 4 domains of the QOL in amputated patients – physical, financial, mental, and emotional were analysed. These domains offered a comprehensive approach to enhancing overall well-being.

Integrating health promotion strategies with the QOL domains in amputated patients, as an essential aspect of public health, focused on enabling individuals and communities to increase control over and improve their wellbeing (Khodaveisi et al., 2021; Ostler et al., 2023). Policies that tackled economic disparities and provided opportunities for education and employment among amputated trauma patients could alleviate stress and enhance overall living conditions, leading to a QOL (Creager et al., 2021).

## 2. Methodology

This systematic review used three databases and corresponding keywords found in table 1, for searching relevant literature on the QOL in amputated patients. The databases listed were PubMed, ProQuest, and Google Scholar. The use of databases like PubMed, ProQuest, and Google Scholar, combined with specific search terms, underscored the importance of a well-planned search strategy in identifying comprehensive and pertinent literatures for this systematic review (Harari et al., 2020).

Table 1
Databases

| | Key words |
|---|---|
| PubMed | "trauma + QOL + patient + amputat*n" |
| ProQuest | "QOL" and "limb loss" |
| Google scholar | "amputation + QOL" |

For PubMed, the keywords were "trauma + QOL + patient + amputat*n." This combination likely ensured a focused search on trauma-related quality of life issues in patients who had undergone amputation, using the truncation symbol (*) to capture various forms of the word "amputation." For ProQuest, the keywords used were "QOL" and "limb loss." This straightforward search strategy aimed to identify studies specifically addressing QOL and limb loss, possibly retrieving articles from a broader range of disciplines available in ProQuest. Lastly, for Google Scholar, the search terms were "amputation + QOL." This search was likely intended to capture a wide range of academic articles, theses, and other scholarly documents available through Google Scholar, which spanned numerous disciplines and sources.

Figure 1 showed a flow diagram depicting the process of selecting studies for a systematic review. This flow diagram adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline (Page et al., 2021).

In the PRISMA guideline, the identification stage showed that 110 records were identified through database searching. Of these, 65 duplicates were removed, leaving 45 articles to be screened based on their titles and abstracts. During the

*Corresponding author: ksabdulkarimh@lincoln.edu.my

screening process, 11 articles were excluded for various reasons: 4 for being unrelated to the topic, 6 for being reviews or meta-analyses rather than original research, and 1 for being in a language other than English. This left 34 records for eligibility assessment. At this stage, 30 articles were excluded for lacking sufficient data (25 articles) or being retrospective or not research-based (5 articles). Ultimately, only 4 studies were included in the systematic review.

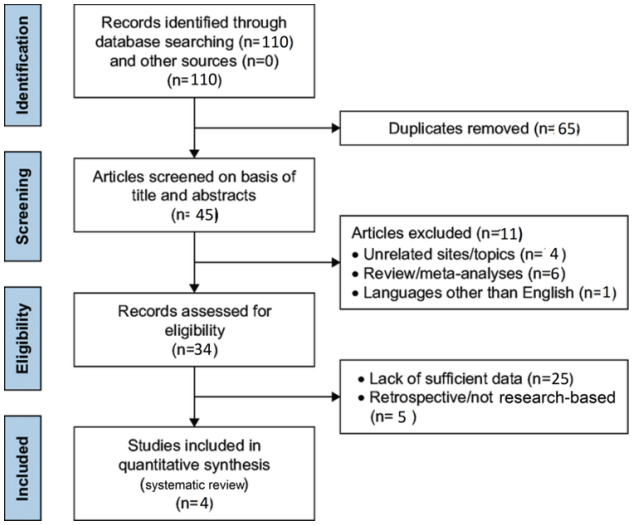


Fig. 1. PRISMA guideline

This process exemplified a rigorous method of narrowing down large volumes of research to ensure that only the most relevant and high-quality studies are included in the final analysis (Sarkis-Onofre et al., 2021). The systematic approach involved clear criteria at each stage to exclude studies that do not meet the necessary standards for inclusion, thus ensured the reliability and validity of the conclusions drawn from the review. The detailed and methodical exclusion criteria applied at various stages highlight the stringent standards upheld in systematic reviews, which were critical in synthesizing high-quality evidence in healthcare research.

Analysing biases in studies often have distinct methodological characteristics encompassing a comprehensive evaluation of the study design, data collection methods, and reporting practices (Pigott & Polanin, 2020). This system would focus on the following key analysis: study design appropriateness, sampling methods, measurement reliability and validity, data analysis transparency, and conflict of interest disclosures.

First, evaluating the appropriateness of the study design involved examining whether the design chosen aligns with the research question and objectives (Polanin et al., 2019). This included assessing if the study design adequately addresses potential confounding factors and whether the methods used were suitable for the type of data collected. For instance, in observational studies, it was important to check if the researchers had implemented strategies to minimize selection bias, such as using a well-defined inclusion and exclusion criteria, and if they had employed techniques like matching or statistical controls to account for confounders.

Second, the sampling methods used in the study needed thorough examination (Berndt, 2020). This involved evaluating how the sample was selected, whether it was representative of the broader population, and the potential for sampling bias. Convenience sampling or purposive sampling was often used, which could introduce bias if the sample does not adequately reflect the target population. It was crucial to assess if the sample size was sufficient to provide reliable results and whether the sampling method could lead to systematic differences between the study sample and the population.

Third, the reliability and validity of the measurements employed in the study were critical aspects of bias analysis (Johnson et al., 2023). This included assessing whether the measurement instruments were validated and reliable, and if they were consistently applied across all study participants. Any inconsistencies in measurement procedures could introduce measurement bias, which affected the study's internal validity. It was also important to evaluate if the researchers had addressed potential issues of measurement error and if they had provided sufficient detail about the measurement process.

Fourth, transparency in data analysis was important in analyzing a bias in a study (van de Schoot et al., 2021). This involved examining if the researchers had clearly described their data analysis methods and if they had pre-specified their analytical approach. Transparency included whether the researchers had conducted appropriate statistical analyses, if they had reported all planned analyses, and if they had addressed potential issues of data dredging or selective reporting. The clarity and completeness of reporting statistical methods and results were essential to evaluate the robustness and credibility of the findings.

Lastly, disclosing conflicts of interest and funding sources was vital to assess potential bias (Suri, 2020). Conflicts of interest could influence the study design, data collection, analysis, and reporting of results. It was important to examine if the authors had disclosed any financial or personal relationships that could affect the study outcomes and if the funding sources had influenced the study in any way. Transparent disclosure practices contributed to the credibility and trustworthiness of the research findings.

## 3. Results

Of the 110 records identified on databases, only 4 studies were used in this systematic review. The other studies eliminated were used as supporting references.

Tulsky et al. (2023) conducted a qualitative research design to identify health-related quality of life domains after upper extremity transplantation focusing on the emotional domain, examining the quality of life, body image, and self-esteem in patients with unilateral transtibial amputations. The findings indicated that happiness, motivation, enjoyment of life, forgiveness, and contentment were vital for the emotional well-being of amputated patients. This study highlighted the importance of addressing emotional health and providing support to help patients adjust to their new body image and self-perception.

Rooman et al. (2022) employed a longitudinal study design

to assess the determinants of return-to-work quality after sick leave for burnout, but it focused on the financial domain. The findings emphasized the importance of employment, financial independence, and insurance coverage in enhancing the QOL for amputated patients. The study highlighted that financial stability and adequate insurance were crucial for accessing necessary medical care and rehabilitation services, which in turn significantly impact the overall well-being and recovery of patients.

Alessa et al. (2022) utilized a cross-sectional research design to evaluate the psychosocial impact of lower limb amputation on patients and caregivers. The study explored the mental domain, focusing on the psychosocial impact. The findings revealed that motivation, resilience, goal-setting, and a positive outlook on life are essential components of mental well-being for amputated patients. The study underscored the need for psychological support and interventions aimed at fostering these attributes to help patients cope with the mental challenges associated with amputation.

Sarroca et al. (2021), used a cross-sectional design to investigate the body image, and self-esteem in patients with amputations. The study investigated on the physical domain, which provided tailored information on various types of amputations, including partial hand amputations, wrist disarticulations, below-the-elbow amputations, elbow disarticulations, above-the-elbow amputations, shoulder disarticulations, and forequarter amputations. For lower extremity amputations, the study covered partial foot amputations, ankle disarticulations, below-the-knee amputations, knee disarticulations, above-the-knee amputations, hip disarticulations, and pelvic amputations. This detailed categorization helped in understanding the specific physical challenges faced by patients with different types of amputations and the tailored interventions required to address these challenges.

The synthesis of these findings from the four studies elucidates that health promotion for amputated patients was a multifaceted approach. The Physical domain emphasized the need for tailored interventions specific to the type of amputation to improve physical functionality (Puranik et al., 2021). The Financial domain stressed the importance of economic stability and access to resources, which were essential for comprehensive care (Al Asmri et al., 2020). The Mental domain revealed the significance of psychological resilience and support, while the Emotional domain underscored the need for emotional well-being and positive self-perception (Abouammoh et al., 2021).

Health promotion for amputated patients, derived from the synthesis of new knowledge across these domains, involved a holistic approach that addresses physical, financial, mental, and emotional needs (Pashmdarfard & Azad, 2020). By understanding and integrating these various aspects, healthcare providers could develop and implement effective strategies that significantly enhance the QOL for amputated patients.

In evaluating the appropriateness and applicability of the studies by Tulsky et al. (2023), Rooman et al. (2022), Alessa et al. (2022), and Sarroca et al. (2021) in this systematic review, it was essential to apply critical appraisal tools suited to their respective research designs. These tools assessed various aspects of the studies to ensure the validity, reliability, and applicability of the findings.

For Tulsky et al. (2023), who conducted a qualitative study to identify health-related quality of life domains after upper extremity transplantation, the Critical Appraisal Skills Programme (CASP, 2020) checklist for qualitative research was the most appropriate tool. This checklist evaluates ten key areas, including the clarity of the research aims, the appropriateness of the qualitative methodology, the research design, data collection methods, reflexivity of the researchers, ethical considerations, rigor of the data analysis, and the clarity of findings. Upon appraisal using the CASP checklist, the study by Tulsky et al. (2023) demonstrated a clear research aim focusing on emotional well-being, and the use of qualitative methods was appropriate for exploring deep, subjective experiences of patients. The data collection through in-depth interviews and thematic analysis was rigorous, providing rich insights into patients' emotional health, body image, and self-esteem. Ethical considerations were well-addressed, and the findings were clearly presented, emphasizing the importance of emotional support for amputated patients. The study effectively highlighted the need for interventions that enhance emotional well-being, making the findings both valid and applicable.

Rooman et al. (2022) utilized a longitudinal study design with a focus on financial aspects. The Newcastle-Ottawa Scale (NOS) (Norris et al., 2021) for cohort studies was suitable for appraising this study. The NOS evaluated selection of participants, comparability of cohorts, and the assessment of outcomes. Using this tool, the study demonstrated robust selection processes, including a well-defined cohort of individuals returning to work after burnout. The comparability of cohorts was ensured through controlling for confounding variables like job type and support systems. The assessment of outcomes related to financial independence, employment status, and insurance coverage was comprehensive and follows the participants over time, providing valuable longitudinal data. The findings underscored the importance of financial stability and adequate insurance for the well-being of amputated patients, reinforcing the study’s validity and relevance.

Alessa et al. (2022) employed a cross-sectional design to explore the mental domain. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for cross-sectional studies (Cuschieri, 2019) was appropriate here. The STROBE checklist assesses the clarity of the research question, study design, setting, participants, variables, data sources, and methods of data analysis. Appraising this study with the STROBE checklist revealed a clearly defined research question and a well-described study design. The selection of participants was appropriate, and the variables related to motivation, resilience, goal-setting, and positive outlook were well-defined. The data collection methods were detailed, and the statistical analysis is sound. The study's findings highlighted the essential components of mental well-being for amputated patients and emphasize the need for psychological support,

Table 2

| Variables | Studies | Findings |
|---|---|---|
| Emotional domain | (Tulsky et al., 2023) | providing tailored information on partial hand amputations, wrist disarticulation, below-the-elbow amputations, elbow disarticulation, above-the-elbow amputations, shoulder disarticulation, and forequarter amputations; lower extremity amputations like partial foot amputations, ankle disarticulation, below-the-knee amputations, knee disarticulation, above-the-knee amputations, hip disarticulation, and pelvic amputations. |
| Financial domain | (Rooman et al., 2022) | employment and financial independence and insurance coverage |
| Mental domain | (Alessa et al., 2022) | motivation, resilience, goal-setting, and a positive outlook on life |
| Physical domain | (Sarroca et al., 2021) | happiness, motivation, enjoyment of life, forgiveness, and contentment |

making the results both valid and applicable.

Sarroca et al. (2021) investigated body image and self-esteem in amputated patients using a cross-sectional design. The STROBE checklist was also appropriate for this study (Cuschieri, 2019). The appraisal revealed a detailed categorization of various types of amputations and their specific physical challenges. The study effectively described the physical domain of well-being and the tailored interventions required for different types of amputations. The clarity of the research question, comprehensive data collection, and rigorous statistical analysis underscored the study's validity. The findings provided valuable insights into the specific physical challenges faced by patients and the necessary interventions, reinforcing the study's relevance and applicability.

The critical appraisal of these studies using appropriate tools such as CASP for qualitative research, NOS for cohort studies, and STROBE for cross-sectional studies identified their strengths in methodology, data collection, and analysis (Ma et al., 2020). Each study effectively addressed different domains of well-being—emotional, financial, mental, and physical—provided comprehensive insights into the multifaceted challenges faced by amputated patients. The results of these appraisals confirmed the validity, reliability, and applicability of the findings, highlighting the importance of tailored interventions to support the overall well-being of amputated patients.

The results of biases also were manifested in the critical appraisal tools, but in various ways. For Tulsky et al. (2023), potential selection and performance biases could lead to an overestimation or underestimation of the effects observed in the study, affecting its internal validity. In Rooman et al. (2022), measurement and detection biases could result in inaccurate or inconsistent outcome data, thereby compromising the study's reliability. Alessa et al. (2022) faces the risk of presenting a skewed narrative due to reporting bias, which could mislead readers and policymakers about the true efficacy or impact of the intervention or exposure. Sarroca et al. (2021), with potential sampling and conflict of interest biases, provided findings that were not broadly applicable or were influenced by external pressures, thereby undermining the study's credibility and generalizability. These biases could influence the study's outcomes and affect the generalizability of its findings, highlighting the importance of critically evaluating each study on an individual basis (Kiani et al., 2022).

## 4. Discussion

The analysis of biases in the studies conducted by Tulsky et al. (2023), Rooman et al. (2022), Alessa et al. (2022), and Sarroca et al. (2021) involved a detailed examination of their methodological choices, data collection procedures, and reporting practices. Each study had unique characteristics that contribute to potential biases.

Tulsky et al. (2023) and Rooman et al. (2022) primarily faced challenges related to participant selection, measurement consistency, and data completeness. Alessa et al. (2022) was particularly susceptible to biases in reporting and analysis transparency, while Sarroca et al. (2021) addressed issues related to sampling representativeness and potential conflicts of interest. Detailing these biases was crucial for synthesis of new knowledge and for assessing the overall quality and applicability of the research.

Tulsky et al. (2023) presented a study where selection bias was a significant concern. The methods of recruiting participants and the criteria for inclusion and exclusion was not fully transparent, which could result in a sample that was not representative of the target population. This led to a biased result if certain subgroups were overrepresented or underrepresented. Furthermore, performance bias could be present if there were differences in how interventions or exposures were administered or experienced by participants, depending on their group assignments. Without adequate blinding, participants and researchers could alter their behaviours based on their knowledge of the study aims, potentially affecting the outcomes.

Rooman et al. (2022) also faces potential biases, particularly in measurement and detection. If the tools and techniques used to measure outcomes were not validated or if there was variability in how they were applied, this could introduce measurement bias. Additionally, detection bias could occur if the outcome assessors were aware of the participants' group assignments, which might influence their observations and assessments. Incomplete outcome data, or attrition bias, could also be a problem if there were systematic differences between participants who complete the study and those who drop out. The reasons for attrition needed to be thoroughly explored and reported to understand their impact on the study results.

Alessa et al. (2022) had struggled with reporting bias and the selective presentation of findings. If the researchers selectively reported certain outcomes over others based on the results, this could skew the interpretation of the study's effectiveness or associations. For instance, if positive findings were reported while negative or non-significant results are omitted, the study would present an overly optimistic view of the intervention or exposure. Additionally, any deviations from the pre-specified analysis plan that were not transparently disclosed could also contribute to reporting bias, impacting the study's credibility.

Sarroca et al. (2021) could exhibit biases related to sampling methods and the external validity of the study. If the sample was drawn from a specific population that does not generalize well

to other contexts or settings, the applicability of the findings was limited. Selection bias was again a concern if the sample was not representative. Moreover, conflict of interest bias would present if the study was funded by organizations with vested interests in the outcomes. Any undisclosed financial or personal relationships that could influence the study's design, conduct, or reporting need to be critically assessed to ensure the integrity of the findings.

Understanding biases allowed for accurate interpretation of findings by identifying potential distortions in data, thereby enabled the synthesis of new and reliable knowledge (Caldwell & Bennett, 2020). The synthesis of new knowledge in a systematic review was crucial as it had integrated diverse research findings, providing a comprehensive and evidence-based understanding of the topic.

Physical domain was a foundational aspect of QOL, encompassing physical activity, nutrition, and disease prevention (Alanazy et al., 2022). Health promotion in this domain focused on encouraging regular exercise, balanced diets, and routine health check-ups (Fairhall et al., 2022). Physical well-being not only enhanced individual vitality but also reduced the prevalence of chronic diseases, thereby contributed to a higher QOL. By promoting active lifestyles and healthy eating habits, individuals were empowered to take control of their physical health, leading to improved energy levels, reduced healthcare costs, and increased longevity (Alshamrani et al., 2020).

The financial domain of QOL was equally critical, as financial stability and health were deeply interconnected (Alanazy et al., 2021). Economic well-being influenced access to healthcare, nutritious food, and opportunities for physical activity. Health promotion strategies that integrated financial education and support could help individuals manage their resources more effectively, reducing stress and enabling them to invest in their health. Programs that addressed financial literacy, budgeting, and planning for future healthcare needs could alleviate the burden of medical expenses and ensured that individuals could afford necessary treatments and preventive measures. Financial health, therefore, became a cornerstone of overall well-being, supporting other domains by providing the necessary resources for maintaining physical, mental, and emotional health (Lee et al., 2020).

Mental domain, involved cognitive functioning, stress management, and psychological resilience in the QOL among amputated patients (Al-Shenqiti, 2021). Health promotion in this area aimed to reduce the stigma around mental health issues, provide access to counselling and support services, and promote activities that enhanced cognitive health. Techniques such as mindfulness, meditation, and cognitive-behavioral strategies were effective in improving mental health. By fostering environments that support mental well-being, communities could help individuals better manage stress, improve their coping mechanisms, and enhance their overall QOL. Mental health promotion thus contributed to a more resilient and productive society, where individuals were better equipped to face life's challenges (Şimsek et al., 2020).

The emotional domain of QOL pertains to emotional stability, happiness, and satisfaction with life (Wedge et al., 2021). Health promotion strategies in this area focus on building strong social networks, fostering supportive relationships, and encouraging activities that bring joy and fulfilment (Elliot et al., 2023). Emotional well-being was closely tied to physical and mental health, as positive emotional states can boost immunity, enhance recovery from illness, and improve mental clarity. Programs that promote social engagement, community building, and emotional intelligence could help individuals develop better emotional health (Chopp et al., 2023). This, in turn, led to greater life satisfaction and a more harmonious society.

Integrating health promotion across these four domains createed a synergistic effect, where improvements in one area positively influence the others (Iriarte-Roteta et al., 2020). For instance, financial stability allowed for better access to healthcare and nutritious food, which enhances physical health. Improved physical health reduced the stress and anxiety associated with medical issues, benefiting mental and emotional well-being. Likewise, strong mental health supported better decision-making regarding financial and physical health, while emotional well-being fostered resilience and a positive outlook on life.

However, the four domains of the QOL had missed the social relationships and environment as the other domains to enhance the overall well-being among amputated trauma patients (Batten et al., 2020). These other 2 domains could also positively impact health promotion interventions.

Social relationships, the third domain of QOL, were vital for emotional support and community cohesion (Kragh Nielsen et al., 2022). Health promotion efforts could enhance social well-being by fostering environments that encourage social interaction and support networks. Community-building activities, such as group fitness classes, social clubs, and volunteer opportunities, help individuals form meaningful connections. Public health campaigns that addressed issues like social isolation and loneliness, especially among vulnerable populations such as the elderly, could improve social bonds and support systems. Additionally, creating inclusive spaces that celebrate diversity and promote social equity ensured that all community members feel valued and connected (Harwood et al., 2023).

The environment, as the fourth domain of QOL, included the physical, social, and economic conditions in which people live (Ostler et al., 2023). Health promotion initiatives could address environmental determinants of health by advocating for clean air and water, safe housing, and green spaces. Urban planning that incorporates parks, walking paths, and bike lanes encourages physical activity among amputated patients and reduced pollution, directly benefiting health. Efforts to improve access to healthy foods through farmers' markets and community gardens contributed to the environmental domain. Vaccination drives and regular medical check-ups further ensured early detection and management of health issues, contributing to improved physical well-being and longevity (Deepak et al., 2023). Workplace wellness programs that included stress reduction workshops could also play a

significant role in maintaining a motivating environment, leading to increased productivity and overall life satisfaction.

## 5. Conclusion

Health promotion was a multifaceted approach aimed at enhancing the well-being and QOL in amputated patients. By integrating health promotion strategies with the four domains of QOL—physical, financial, mental, and emotional—new knowledge and practices on health promotion was synthesized to foster holistic and sustainable health improvements.

In synthesizing new knowledge through this integrated approach, it became evident that health promotion was comprehensive and multifaceted. Policies and programs addressed the interconnectedness of physical, financial, mental, and emotional health to create environments that support overall well-being. Collaborative efforts among healthcare providers, educators, policymakers, and community organizations were essential to implement strategies that consider all four domains of QOL. This holistic approach not only enhanced individual health outcomes but also contributed to the development of healthier, more vibrant communities. By embracing the complexity of health and well-being, integrated health promotion efforts could lead to sustainable improvements in the QOL for all.

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