



What Patients Think: A Study Examining Perceptions of Teamwork, Self-Management, and Quality of Life of Patients Diagnosed With Diabetic Foot Ulceration

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Identifying strategies to support patients diagnosed with diabetic foot ulceration (DFU) is essential to affect not only wound outcomes but also mortality and quality of life. This article reports on a cross-sectional, descriptive, correlational study of patients receiving treatment for DFU at a specialty clinic. Most participants were <60 years of age and had been diagnosed with diabetes for >5 years. Results indicated that patients with higher self-management scores reported improved general health, physical functioning, and quality of life. These findings, in a younger patient population with normal work and family obligations, suggest that interventions supporting self-management behaviors can improve physical, emotional, and general health and, ultimately, quality of life. The involvement of an interprofessional care team enhances these self-management behaviors.

Thirty-seven million Americans, or 11.3% of the U.S. population, are living with diabetes, and this is one of the highest prevalence rates among industrialized countries (1–3). Globally, the prevalence of diabetes among people aged 20–79 years was 425 million in 2017, and diabetes is a top cause of mortality (2). Type 2 diabetes, the most common form of the disease, affects 25% of U.S. adults ≥ 65 years of age and accounts for 90% of all diabetes cases (1,2).

The management of type 2 diabetes, already multifaceted, becomes even more complex when diabetes-related complications develop. Complications of diabetes typically arise as a result of consistently high blood glucose levels and can include cardiovascular disease (CVD), blindness, kidney damage, and lower-limb amputation (2). The Centers for Disease Control and Prevention reports that smoking, overweight/obesity, physical inactivity, elevated A1C, hypertension, hyperlipidemia, and

hyperglycemia are risk factors for diabetes-related complications (1). Coexisting conditions such as stroke, ischemic heart disease, CVD, diabetic ketoacidosis, and lower-extremity amputation are common reasons for hospitalizations of individuals with diabetes (1).

Diabetic foot ulceration (DFU), a complication of type 2 diabetes, is defined as ulceration of the foot associated with nerve damage that leads to neuropathy and/or peripheral artery disease of the lower limb (4,5). DFU has severe implications for patients, their families, and the health care system. Of the global estimate that 600 million people will have type 2 diabetes by 2035, 50% will develop peripheral neuropathy, and at least 15% will develop at least one foot ulcer (6). Research has identified DFU as the most prevalent chronic complication of diabetes, with an annual incidence of 2.2% (5). The risk of DFU can occur at any age, although severity and mortality are closely related to increased age, duration of diabetes, and the cumulative impact of hyperglycemia (7–9). Traditionally, the diagnosis of DFU has been more common in adults ≥ 65 years of age (63%) (1,4,10). Still, recent data suggest an increasing trend in younger adults aged 18–64 years (37%), as more people are being diagnosed with diabetes at earlier ages and can experience hyperglycemia for a longer period of time (1,4,10).

DFU is often associated with infection and neuropathy, resulting in hospitalization (5,6,11–13). These admissions can cost more than \$40,000 per occurrence, with total expenditures exceeding \$1.5 billion annually (6,12,14). Additionally, more than half of diabetes-related foot ulcers become infected, and 20% of infected foot ulcers result in some level of amputation, leading to decreased quality of life and increased mortality (5,6,11–14). The increased prevalence of DFU results in a mortality rate three times

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higher among people with DFU than in those without this complication (3,6). Because of the high risks of recurrence and mortality in people experiencing DFU, different approaches to prevention need to be considered. In addition, addressing self-management behaviors and the involvement of an interprofessional collaborative (IPC) team can positively affect patient outcomes.

For example, people with diabetes often have difficulty with regimen adherence (15,16). Such challenges may lead to a higher risk for health complications and increased economic burden on individuals, families, and the health system (2). Health promotion activities that encourage self-management behaviors support patient and family member engagement in treating chronic conditions. Self-management behaviors have been widely recognized as an integral part of chronic illness care that empowers patients, improves health outcomes, and reduces costs (16).

Traditionally, the U.S. health care system has endorsed the acute care model, in which health care professionals are the decision-makers and patients are passive participants (17–19). The current short hospital stays offer limited opportunities for patients to establish relationships with providers, much less participate in a care routine (18). Concurrently, advances in health care have resulted in longer lives for people with chronic conditions, and families often become the primary caregivers as patients age (17,18).

Although early screening and diagnosis are essential, access to organized, sustained care by a team of health care professionals can influence chronic disease outcomes at the primary care level. The World Health Organization defines IPC team practice as multiple health and social care professionals providing comprehensive, safe, and quality health services by working with communities, patients, and families (3). After more than 50 years of emphasis on team-based practice, it is clear that effective collaboration within health care teams enhances services that improve health outcomes (3).

The fundamental difference an IPC team contributes to patient care is its ability to provide evidence-based knowledge that centers on individuals' needs and goals in an integrated manner (20,21). When IPC teams are engaged, patients become equal participants who actively manage their condition by sharing responsibility with the team (20,22,23). In this model, IPC teams are an essential, but not the only, resource in supporting health-related quality of life for people living with chronic illnesses such as diabetes. Active IPC teams encourage a paradigm shift toward a

joint care model that keeps patients and families at the center of all health care decisions. Given this level of accountability and autonomy, patients and families must have access to timely and accurate knowledge to support their treatment and care decisions.

Evidence demonstrates that the metrics related to diabetes have improved with the engagement of IPC teams. The contributions of IPC teams have been found to improve glycemic stability and health-related quality of life (HRQoL) while reducing A1C, risk of lower-limb amputation, and mortality compared with care provided by individual clinicians (20). The specialization of health care services and the complexity of managing chronic diseases has led to international recognition of the benefits of diabetes management by IPC teams that include patients as active participants (16,20,22).

Although evidence supports the IPC team approach to diabetes care, patient perceptions of IPC teams vary. Patients often report that IPC teams give the best care when they include both family members and appropriate health and social care professionals (24). Thus, the objective of this study was to explore the relationship between patient perceptions of IPC teamwork, their self-management behaviors, and HRQoL in patients diagnosed with DFU.

The coronavirus disease 2019 (COVID-19) pandemic provided additional health concerns to this already vulnerable patient population. Early in the pandemic, it was noticed that older patients with risk factors, including hypertension, CVD, poor glycemic control, and pre-existing diabetes, experienced up to three times greater mortality than those without such risk factors (25,26). In the first 2 months of the pandemic, A1C testing decreased by as much as 66% (27). Although treatment teams could adapt the care of some chronic health conditions, patients diagnosed with DFU were obliged to continue in-person care (26).

Sample and Setting

After approval was obtained from the institutional review board (IRB), participants were recruited from a wound care clinic in rural southeastern North Carolina. The sample consisted of patients diagnosed with DFU confirmed by the inclusion in the medical record of *International Classification of Diseases*, 10th Revision, code E11.621. All participants were ≥ 18 years of age, could read and comprehend English, and volunteered for the study. Individuals who were not diagnosed with diabetes and ulceration of the lower extremities and

those who could not read and comprehend English were excluded. Older adults were defined in this study as individuals ≥ 65 years of age.

The IPC team model implemented at the Wound Healing Center included a registered nurse, a certified wound care nurse, a general surgeon, a bariatric chamber certified staff member, and a physician assistant. Additional care professionals, including diabetes nurse educators, physical and occupational therapists, home health nurses, care aides, and pharmacists, were available via referral.

Research Design and Methods

A cross-sectional exploratory, descriptive, correlational design was used to answer the following research question: What are the relationships between perceptions of teamwork, self-management, and HRQoL in patients diagnosed with DFU?

The participants completed an investigator-developed study packet. The packet included a demographic data form and three standardized instruments to measure study variables. The demographic data form had self-reported sociodemographic information (education, age, race, and sex) and clinical characteristics (BMI, diabetes duration, comorbidities, and the composition of the IPC team).

Standardized instruments included the Patients Insights and Views of Teamwork Survey (PIVOT), Patient Activation Measure (PAM), and Short-Form 12, v. 2.0 (SF-12v2), a self-reported measure of HRQoL. All standardized instruments have been validated and deemed reliable and were used with the authors' permission (28–32).

Procedures

To ensure informed consent, eligible participants received an explanation about the purpose of the study. The investigator was on site for each research session and administered the study packet during the fourth wound care treatment appointment. This time was selected because it was the usual midpoint of the appointments needed for DFU healing. Additionally, surveying patients during the fourth treatment session allowed them to first encounter the IPC team care.

The study packet was organized and completed in the following order: demographic data form, PAM, PIVOT, and SF-12v2. The study instruments were determined to be written at a fourth-grade reading level. Completing the study materials took ~ 20 minutes. All eligible participants completed the study packets as designed at the fourth wound treatment session and provided complete

data ($N = 64$). Data collection occurred on the day of survey completion and extended over 9 months. Participants received a \$25 Walmart gift card after completing the surveys. Data collection began at the beginning of the COVID-19 pandemic.

Human Subject Protection

Approval of this study was obtained from the university and medical center IRB. Informed consent and Health Insurance Portability and Accountability Act privacy authorization were obtained, and no protected health information was collected in the surveys.

Data Analyses

Demographic data were analyzed using univariate and descriptive statistics. Pearson correlation coefficients were calculated to describe the strength and direction of linear relationships between continuous variables. All data were analyzed using the SPSS, v. 24, statistical software (IBM Corp.) (33). Descriptive frequency tables were used for the categorical demographic and clinical-related variables. Means and SDs were calculated for PIVOT, PAM, and the eight categories of the SF-12v2. Pearson correlations were conducted to examine relationships among PIVOT, PAM, and eight subscales of the SF-12v2. Statistical significance was defined as $P < 0.05$.

Results

Descriptive statistics were used to describe the characteristics of the study sample (Table 1). A total of 64 patients were surveyed. Most of the participants were male (69%) and White (70%), and nearly half of the sample were high school graduates (45%) and < 60 years of age (44%).

Table 2 presents the clinical characteristics of the patients. Most patients (80%) had a diabetes duration > 5 years, had high cholesterol or high blood pressure, and were treated most often by a physician, a nurse, or a physical therapist. When asked how many health care team providers they had seen in the past 6 months, $> 70\%$ of the patients ($n = 45$) reported seeing three to six providers.

The means and SDs of the study measures are presented in Table 3. Patients rated perceptions of teamwork among the Wound Healing Center staff as occurring all the time. Patients also expressed their agreement on the ability to self-manage their health condition. The eight categories on the HRQoL scale range from 0 to 100 points, with higher scores indicating better physical and mental health functioning. If patients perceived that their physical and emotional health affected daily

activities, it was reflected in their HRQoL scores. In the answers of the study participants, this was evident in the categories of role physical, role emotional, and general health and indicated by the responses of feeling that they accomplished less or were limited in some way (role physical, mean = 8.59), accomplished less and were not careful (role emotional, mean = 24.22), and feeling like they became sick easier (general health, mean = 26.95). HRQoL results were negatively affected when patients reported higher mental health concerns and physical pain in their everyday activities. This was evidenced in the mental health category, where patients expressed feeling blue, sad, or down in the dumps (mean = 62.97), and in the bodily pain category, where they felt pain interfered with their daily life (mean = 50.39).

Pearson correlations among the study measures are presented in Table 4. Small correlations were noted on several scales, although these were not statistically significant. A small correlation was noted between how patients perceive teamwork and their self-management behaviors ($r = 0.17$). Small correlations were found between patient perceptions of teamwork, physical functioning ($r = 0.33$), physical health ($r = 0.11$), and bodily pain ($r = 0.11$). The ability of patients to self-manage their chronic condition correlated with perceptions of general health ($r = 0.31$), physical functioning

TABLE 1 Sociodemographic Characteristics of Participants ($N = 64$)

Characteristic	<i>n</i> (%)
Age, years	
<60	28 (43.8)
60-69	28 (28.1)
70-88	18 (28.1)
Sex	
Female	20 (31.3)
Male	44 (68.8)
Race	
White	45 (70.3)
Black	19 (27.7)
Marital status	
Single	16 (25.0)
Married/partnered	24 (37.5)
Divorced/separated	10 (15.7)
Widowed	14 (21.9)
Highest educational level	
Less high school	11 (17.2)
High school	29 (45.3)
Some college	9 (14.1)
University or post-graduate degree	15 (23.4)

TABLE 2 Clinical Characteristics of Participants

Characteristic	<i>n</i> (%)
Diabetes duration, years	
<1	3 (4.7)
1-5	9 (14.1)
>5	51 (79.7)
Missing	1 (1.6)
Comorbidities	
High cholesterol	43 (67.2)
High blood pressure	56 (87.5)
Heart disease	22 (34.4)
Lung disease	8 (31.3)
Other	10 (12.5)
IPC team members	
Nurse	62 (96.9)
Doctor	62 (96.9)
Nutritionist	19 (29.7)
Physical therapist	27 (42.2)
Bariatric counselor	2 (3.1)
Diabetes educator	20 (31.3)
Pharmacist	17 (26.6)
Other	7 (1.9)
Number of providers seen	
1	3 (4.7)
2	16 (25.0)
3	20 (31.2)
4-6	25 (39.1)

($r = 0.13$), pain ($r = -0.04$), energy level ($r = 0.16$), emotional functioning ($r = 0.18$), and mental health ($r = 0.14$). The most notable statistically significant correlations on the HRQoL category scales were found between physical and emotional health ($r = 0.51$) and mental health and bodily pain ($r = 0.42$).

Discussion

Few studies have examined associations between patients' perceptions of teamwork, their self-management behaviors, and their HRQoL. In addition, the ability to link the presence of IPC teams to improved patient self-management of chronic conditions has a limited presence in the literature. The available studies that do address these variables show promise in positive care outcomes when patients, families, and providers combine efforts as part of an IPC team (20,34-38). This was evident in our study, in which relationships, although not statistically significant ones, were identified between what patients viewed as teamwork and their ability to manage the care of their DFU.

Relationships between the availability of an IPC team and self-management behaviors, as well as their possible influence on HRQoL, were supported by the findings

TABLE 3 Descriptive Statistics for Study Measures

Measure	Mean ± SD	Theoretical Range	Cronbach's α
PIVOT total score	68.5 ± 9.58	0–80	0.71
PAM total score	31.78 ± 3.67	10–40	0.78
SF-12v2 categories, total score			0.77
Physical functioning	37.50 ± 35.91	0–100	
Role physical	8.59 ± 26.06	0–100	
Bodily pain	50.39 ± 40.21	0–100	
General health	26.95 ± 16.85	0–100	
Vitality	43.75 ± 32.24	0–100	
Social functioning	47.66 ± 32.03	0–100	
Role emotional	24.22 ± 40.82	0–100	
Mental health	62.97 ± 25.74	0–100	

of our study and merit further investigation. These results further suggest that the team approach to wound healing affects patients with DFU in positive ways. For example, an increase in self-management behaviors positively affected general health. Specifically, as patients felt more competent caring for their foot ulcer, they also reported feeling better about their overall health. Our study also indicated that, when the health care team's interventions address patients' general health concerns, they can positively influence their reported HRQoL. Considering this, IPC teams in primary care should not neglect to focus on patients' general health when treating their chronic conditions.

Several small correlations were noted between mental health and HRQoL. We reported a positive association

between mental health and bodily pain and the same results in the relationship between emotional and physical health. Mental health was found to have significant relationships with bodily pain, emotional concerns, and the ability to socialize, all of which were reflected in the patients' HRQoL. IPC teams are advised to consider and assess the impact on HRQoL by screening for feelings of depression, anxiety, and other mental health conditions during primary care visits. For example, in this study, interventions that addressed emotional and psychological health may have improved self-management behaviors and overall health outcomes.

The age demographic of adults diagnosed with diabetes is changing. Incidence rates in adults aged 45–64 years have outpaced those of adults <44 and >65 years of

TABLE 4 Correlations for Study Variables

Variables	1	2	3	4	5	6	7	8	9	10	11
1. PIVOT	–										
2. PAM	0.17	–									
3. Physical functioning	0.33†	0.13	0.11	–							
4. Role physical	0.11	0.12	0.06	0.37†	–						
5. Bodily pain	0.11	–0.04	0.3	0.37†	0.09	–					
6. General health	0.06	0.31*	0.23	0.30*	0.28*	0.12	–				
7. Vitality	0.08	0.16	0.02	0.14	0.04	0.11	0.22	–			
8. Social functioning	–0.15	–0.01	–0.07	0.26*	0.24	0.36†	0.30*	0.12	–		
9. Role emotional	–0.14	0.18	0.10	0.21	0.51†	0.08	0.16	–0.06	0.27*	–	
10. Mental health	–0.07	0.14	0.08	0.02	–0.01	0.42†	0.12	0.13	0.36†	0.30*	–

*P < 0.05. †P < 0.01. ‡P < 0.001.

age (1). Reflecting this, >40% of the individuals in our study were <60 years of age and had already developed a DFU. Younger individuals with a DFU are significantly affected by employment challenges such as reduced productivity, absenteeism, and inability to work, as well as resulting health care expenses. DFU can also contribute to the loss of productivity within households, such as difficulties with childcare and family responsibilities. Interventions that address HRQoL are crucial to this younger group of patients because of the profound impact of the illness on busy work schedules and family life.

Limitations

The sample of patients diagnosed with DFU at a single site in southeastern North Carolina does not represent the population nationwide. In this study, participants were younger and had a longer duration of diabetes than is typically reported of patients diagnosed with DFU. The younger age and length of experience with their chronic condition may have increased their awareness and knowledge, influencing their responses to survey questions. Relationships between patient perceptions of IPC teamwork, self-management behaviors, and HRQoL have rarely been explored. A follow-up multisite study with a larger sample size of participants would allow for more thorough investigation of these associations.

Although survey descriptions, definitions, and examples were explained clearly and consistently, understanding among participants may have varied. Several participants requested that the research team read the survey instruments because of their poor visual acuity. Doing so may have affected their responses. Future versions will address visual acuity issues by increasing the font size to accommodate participants with impaired vision.

The restrictions of the COVID-19 pandemic placed challenges on patient-centered care for individuals with diabetes and DFU. Many studies of patients with diabetes during the pandemic focus on hospitalization and comorbidities. The full implications of how type 2 diabetes and COVID-19 affected the care of patients with DFU remains unknown. Patients have increasingly struggled to sustain self-management behaviors during the pandemic because of disruptions in laboratory testing, screening services, and the ability to keep appointments (26,27). Many wound care clinics paused in-person visits, resulting in delayed debridement, off-loading, and dressing changes. In addition, patients with diabetes found self-management challenging (39). As a result of these circumstances, it is not surprising that patients diagnosed with diabetes reported higher levels of stress, anxiety, and depression

(39). Social gathering restrictions affected regular social support and increased stress, anxiety, and depression, directly affecting glycemic control (39).

Our study identified increased psychological health concerns and the importance of social functioning and emotional health to general health. As we continue to face the challenges of the pandemic and future national and global crises that affect access to care, IPC teams must develop support mechanisms to monitor crucial components of diabetes care, psychological health, and self-management behaviors (39,40). The data collection period in this study was right at the beginning of the COVID-19 pandemic. Much of the pandemic information we now know was changing rapidly during those early days. We do not know how navigating through the pandemic may have affected participant responses and research results.

Conclusion

This study described correlations between patients' perceptions of teamwork, self-management behaviors, and HRQoL in patients with DFU. Results indicate that patients' perceptions of their physical, mental, and general health affected their reported HRQoL. Our study may guide the development of interventions using the patient-family-IPC team triad to positively affect individual and population health outcomes. One strategy would be for the primary care team to include discussions of lifestyle management and support/referral for mental health concerns that affect patients' HRQoL.

Larger studies may offer additional insight into how to enhance the patient-family-IPC team relationship. Future studies should also consider educating patients, families, and IPC teams on practices supporting self-management behaviors. One of the many lessons learned during the pandemic was that, for patients and families to self-manage their care, interprofessional team support and associated resources are necessary, especially in such unusual circumstances. Finally, studies such as ours can serve as a first step in demonstrating how IPC teams can serve as a support mechanism to enhance self-management in patients with chronic conditions.

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DUALITY OF INTEREST

No potential conflicts of interest relevant to this article were reported.

AUTHOR CONTRIBUTIONS

L.B.S. collected and processed the data. L.B.S. contributed to the study concept and design, study supervision, data analysis, and study interpretation. Both authors contributed to the manuscript writing. Both authors are guarantors of this work and, as such, had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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