Contemporary Indications for Vascular Surgery Fail to Achieve Desired Patient-Centered Outcomes When Applied to Critical Limb Ischemia

Matthew F. Hudson, PhD; John J. McLeod; Kaitlyn M. Dunphy, BS; William M. Bristow Jr, BS; Gabrielle S. Genal, BS; Yonge R. Jones, MHA; Brent L. Johnson, PhD; Peggy J. Wagner, PhD; David L. Cull, MD; and Spence M. Taylor, MD

From the Greenville Health System Clinical University, Greenville, SC (M.F.H., J.J.M., K.M.D., W.M.B., G.S.G., Y.R.J., B.L.J., D.L.C., S.M.T.); and University of South Carolina School of Medicine Greenville, Greenville, SC (M.F.H., P.J.W., D.L.C., S.M.T.)

Abstract

Background: The purpose of this analysis is to examine desired patient outcomes after vascular surgery and to measure the achievement of these outcomes when applied to a large cohort of patients undergoing intervention for critical limb ischemia (CLI).

Methods: To understand patient expectations after vascular intervention, 102 consecutive patients undergoing elective operations were prospectively administered a standardized preoperative questionnaire regarding the characteristics of a successful outcome. The following were identified: 1) maintenance of living independence, 2) maintenance of ambulatory status, 3) control/relief of pain, 4) no additional/nonroutine physician visits, and 5) survival for 1 year. These outcomes were then applied retrospectively to a cohort of 954 consecutive patients with CLI (37% rest pain, 37% ischemic ulceration, 26% gangrene) undergoing planned intervention (57% open, 41% endo, 2% both) to analyze patient-centered success.

Results: While 12-month overall success for maintenance of independence was 89% (n = 849), maintenance of ambulation 84% (n = 802), control/relief of pain 48% (n = 461), no additional physician visits 36% (n = 340), and 1-year survival 79% (n = 755), overall patient-entered success (achievement of all 5 patient-centered success outcomes) was accomplished in only 23% (n = 218) of patients. Of 20 variables examined, end-stage renal disease (OR [95%CI] 2.21[1.26-3.88]; P = .006) and impaired ambulatory status preoperatively (OR [95%CI] 1.76 [1.12-2.79]; P = .015) were independent predictors of failure. The probability of experiencing patient-centered failure was 93% in patients with both end-stage renal disease and impaired ambulatory status preoperatively.

Conclusions: If patients alone are allowed to define their outcomes after vascular intervention, success is infrequent. These data suggest that successful overall outcome may best be achieved when physicians and patients mutually target specific attainable goals and strive to achieve them.

When planning intervention for their patients, surgeons are trained to achieve the best outcome possible. Typically, that outcome is defined by evidence accumulated through medical research from surgical investigators who often focus on postoperative goals they deem as important. In the case of vascular disease, surgeons define treatment success referencing parameters such as survival, intervention patency rate, 30-day complication rate, and freedom from comorbid vascular event. Though important, these definitions of success...
The questionnaire utilized when determining patient-centered outcomes for 102 patients undergoing elective vascular surgery.

RESEARCH STAFF: Check the line below if patient refused to participate and save this questionnaire as if patient completed it.

Patient Refused: ___________

RESEARCH STAFF: Ask the questions below and write the responses in the spaces by or under the questions:

(1) What is the reason you are having surgery?
(2) Is there anything that helped you decide surgery was the best choice for you?
(3) What will surgery allow you to do that you cannot do now?
(4) What do you consider a successful surgical outcome?
(5) Is there anything you will need to do to help you get better after surgery?
(6) How long do you think it will take you to recover after your surgery?
(7a) Do you think the surgery may keep you from doing things you want?
(7b) What are the thing you think surgery will keep you from doing?
(8) How many times do you think you will have to come back to the doctor for "follow up"?
(9) We listed some things that some people hope surgery improves. I'll put a check by any items you hope your surgery improves. I can check as many or as few as you like.
  Pain Relief________
  Daily functioning (washing, shopping)________
  Avoiding repeat doctor visits for the same problem________
  Hobbies________
  Mobility________
  Anything not listed, but important to you? [IF YES, RESEARCH STAFF WRITE IN "OTHER"]________
(10) Thinking about what you checked above. Help me order them by how important they are to you. I'll number the items from most important with a "1", the item you think is second most important with a "2", the item you think is third most important with a "3". I'll continue numbering until rank all items you checked.
  Pain Relief________
  Improve daily functioning (washing, shopping)________
  Avoiding repeat doctor visits for the same problem________
  Hobbies________
  Mobility________
  Other item patient identified above________
(11) What is your gender
  Male________
  Female________
(12) How old were you on your last birthday
  Age________
(13) Are you Hispanic, Latino, or Spanish Origin?
  No, not Hispanic, Latino or Spanish Origin________
  Yes, Mexican, Mexican American, Chicano________
  Yes, Puerto Rican________
  Yes, Cuban________
  Yes, another Hispanic Latino or Spanish origin________
(14) What is your Race?
  White________
  Black (African American)________
  American Indian or Alaskan Native________
  Asian________
  Other________

RESEARCH STAFF: Read the statement below to the patient: There are no more questions for you to answer! Thank you for sharing with us!

For Research Staff
Note the surgery patient is scheduled to undergo:
  Carotid Endarterectomy________
  Endovascular Surgery________
  Aortic Aneurysm Repair________
  Aneurysm: Open________ Closed________
  Revascularization of Lower Extremities________
  Other________

Methods
Our study is comprised of 2 components: 1) a prospective cohort solicitation of patient-perceived outcome priorities, and 2) a retrospective review and assessment of outcome success using the prospectively identified outcome criteria.

Prospective Cohort
Participants
We solicited 108 consecutive adults (≥18 years of age) being scheduled for elective vascular surgery by a vascular surgeon within Greenville Health System (GHS), whom the research nurses observed to have the physical and emotional capacity for participation.

Instruments
Study investigators (M.F.H., S.M.T., and P.J.W.) developed a standardized preoperative questionnaire (Fig. 1) that posed open-ended questions regarding patients’ perceived need for vascular intervention and qualitatively inquired about their perception of a successful outcome. The questionnaire asked patients to rank 6 health improvement targets: pain relief, daily functioning (eg, washing, shopping), work attendance, avoiding repeat doctor visits for the same problem, hobbies, and mobility. The questionnaire also provided an opportunity for patients to identify improvement targets not listed (eg, “Anything not listed, but important to you?”).

Procedure
Subsequent to both physician consultation (ie, standard clinical practice) and surgery scheduling, a research nurse solicited patient participation in the research project by first introducing the project and acknowledging, “Surgery is important care for many people, but we think that each person has different hopes and goals for surgery.
We want to ask you questions that help us learn about the care outcomes that are most important to you.” The research nurse facilitated informed consent and mitigated coercion by informing the patient of the right to decline participation without compromising care. Research nurses posed the respondents’ questions orally and immediately noted/marked the responses accordingly on the questionnaire while the patient was present in the outpatient vascular clinic.

Retrospective Data Review

The Vascular Surgery Database was established in 1992, registering all cases performed on the vascular surgery teaching service. Since 1998, a subset of patients with lower extremity peripheral arterial disease (PAD) has been closely scrutinized and actively followed under the aegis of the GHS Institutional Review Committee. Each lower extremity vascular procedure is entered on an Excel spreadsheet (Microsoft Corp., Redmond, Wash.). Preoperative demographics are entered into the database at presentation. Functional information, to include ambulatory and independent living status, is also included. Information is updated with each follow-up office visit. Routine follow-up for infrainguinal bypass grafts includes noninvasive duplex scan derived graft flow velocities obtained at 1 month, every 3 months for the first 18 months, and then every 6 months thereafter. Interventions for failing bypass grafts (intrinsic or juxta anastomotic stenoses with a graft flow velocity >300 cm per second and distal velocities <45 cm per second) are performed to restore normal hemodynamics. Patients receiving bypass for aortoiliac occlusive disease are followed with a patient visit and an ankle-brachial index (ABI) study at 1 month and then at 6-month intervals. Patients receiving an endovascular procedure are assessed with ABIs within 1 month of intervention and followed with repeat ABIs every 6 months.

To complement information obtained at each follow-up visit, the database is scrutinized each summer by independent research workers looking for missing data points or missing patients. Sources used to attain follow-up include the hospital computerized Lifetime Clinical Record, the computerized radiology Picture Archiving Communication System (PACS), and the online obituary services of all statewide newspapers.

For the purposes of the study, we adapted the findings of the patient-derived expected outcomes survey (see right) to define 5 separate 12-month patient-centered outcomes. Next, the team retrospectively applied these 5 outcomes to a cohort of 954 consecutive patients from our Vascular Surgery Database undergoing intervention for CLI using standard indications from January 1998 through December 2007. To be included, a patient must have had complete follow-up (to death), or at least 9 months of follow-up with a vascular surgeon and known to be alive (some interaction with the health system) for at least 12 months following the index procedure date. For patients with both limbs enrolled in the database, we included only the first limb, per date of index procedure.

The evaluation tool used to retrospectively review the lower extremity database is shown in Table 1. Based on the overall findings of the questionnaire, the study team defined patient-centered success as achieving each of the following: 1) mainten-

For the purpose of the study, we defined “maintenance of living status” and “maintenance of ambulatory status” as maintenance or improvement in status 1 year following intervention. We defined “failure” as deterioration in status (e.g., “independent” to “nursing home” or “ambulatory” to “homebound ambulatory”). For “control/relief of pain,” we defined success as no pain requiring narcotics 3 months following the initial procedure. For “no additional/nonroutine physician visits,” we defined success as needing no more than routine surveillance (routine surveillance was defined as an outpatient physician visit 1 week posthospital discharge, 1 visit 4-6 weeks postdischarge, and every 3 months for the first 18 months). In patients with tissue loss, wound center visits for wound management were scheduled as needed after intervention and were considered routine follow-up for the purpose of the study. For “survival,” success was defined as survival for 12 months postprocedure. For the purpose of the analysis, we considered an overall patient-centered outcomes success as achievement of success for all 5 outcome parameters listed in Table 1. Using the above criteria, follow-up was completed (within 9 months) on all 954 patients studied.

Next, we employed bivariate analysis to predict patient-centered success/failure after intervention. Variables analyzed included age, sex, ethnicity, history of cigarette smoking, presence of diabetes, presence of end-stage renal disease, presence of coronary artery disease (moderate to high risk as scored by the Eagle criteria), presence of hypertension, presence of hyperlipidemia, obesity (BMI >30), presence of chronic obstructive pulmonary disease, history of cerebrovascular accident, history of associated cerebrovascular disease, history of dementia, history of prior vascular surgery, independent living status, preoperative ambulatory status, level of atherosclerotic disease (aortoiliac versus infrainguinal), presentation (ischemic ulcer versus gangrene), and type of intervention (endovascular or open bypass). Our database characterizes preoperative ambulatory status as ambulatory (independent ambulation out of house), ambulatory/homebound (ambulatory in home only), nonambulatory/transfer (eg, uses legs to transfer from bed to chair or from the chair to the commode), or nonambulatory/bedridden. In each case, ambulatory status is determined by physical conditions thought to be independent of their vascular condition. Thus, “ambulatory status” is defined as...
the patient’s functional status immediately before the development of vascular symptoms. With this definition, ambulatory impairment is typically a function of other medical comorbidities such as arthritis, sequelae of cerebrovascular and cardiovascular disease, or advanced age. If the impairment was indeed a function of the patient’s vascular disease, it was assumed that the functional status would change (improve) accordingly after revascularization. Further, for the purpose of this study, the study team defined “change in ambulatory status” as a permanent postoperative change in ambulatory classification, despite full recovery from surgery. Our analysis grouped patients classified as ambulatory/homebound or nonambulatory/transfer only together, and termed them “impaired ambulatory status.” Nonambulatory/bedridden patients are typically not offered intervention in our practice and were not included in the analysis.

Last, we entered comorbidities and variables determined significant in bivariate analysis into a multivariate model using logistic regression analysis predicting success/failure. We calculated odds ratios (OR) and 95% confidence intervals. After determining these independent predictors of success/failure, we calculated probability of failure (%) for each predictor and for combinations of predictors.

Statistical Analysis
Chi-square tests were used for bivariate analyses of success/failure and categorical patient characteristics. We employed Fisher’s exact tests when fewer than 5 observations existed in any subgroup. We employed student’s t-test to compare mean age of successes and failures. We employed logistic regression to model the likelihood of a failed outcome given specific patient characteristics. Odds ratios and 95% confidence intervals were estimated. All variables that were significant in the bivariate analyses were included in the full model. Probability of failure (%) was determined using logistic regression. Last, we employed Kaplan Meier life table analysis to determine limb salvage over time. The data analysis was generated using SAS software, Version 9.1.3 of the SAS System (SAS Inc., Cary, NC).

Results
Patient demographics and procedure type of the prospective cohort are depicted in Table 2. When asked, 66% of the patients reported that the reason for surgery was because the surgeon advised it. Of the health improvement targets that patients were asked to rank as important, 82% selected “avoid repeat doctor visits,” 65% chose “maintenance of daily functioning,” 61% selected “maintenance of mobility,” 58% selected “pain relief,” and 54% selected “maintaining current hobbies.” Patient responses rarely varied according to the vascular condition at presentation (eg, patients needing carotid intervention answered similarly to patients needing lower extremity PAD). When asked to rank these targets as “most important” to “least important,” 4 targets emerged as being most important (Fig. 2): 1) pain relief, 2) maintenance of mobility, 3) avoid repeat doctor visits, and 4) maintenance of daily functioning. Based on these findings, we selected our 5 parameters of patient-centered success (maintenance of living independence, maintenance of ambulatory status, control/relief of pain, no additional/nonroutine physician visits, and survival for 1 year).

Application of outcome measures for patient-centered success was completed for all 954 patients. We have previously reported, in detail, traditional outcomes of interventional patency, limb salvage, maintenance of ambulatory status, and maintenance of independent living status after intervention for lower extremity PAD for the GHS Vascular Database. For this study cohort, 243 of the 954 patients (25.5%) eventually underwent limb amputation (187 of these amputations occurred within 12 months of index procedure). Using life-table analysis, limb salvage at 24 months was 75 ± 1% (468 remaining at risk). Thirty-day/in-hospital mortality occurred in 41 patients (4.3%).

Table 3 depicts the proportion of patients achieving successful patient-centered outcomes utilizing the composite definition. While success for the individual patient-centered outcome components ranged from 35.6% (no additional or nonroutine
physician visits) to 89.0% (independent living), the overall patient-centered outcomes success was 22.9%. Limb loss was a statistically significant predictor of patient-centered failure ($P < .001$). Of the 187 patients undergoing limb amputation within 12 months of the index procedure, 9 (4.8%) were considered successes according to the patient-centered outcomes criteria; 178 (95.2%) were considered failures.

Table 4 shows the effect of 20 specific patient and procedural variables on the success and failure of patient-centered outcomes using bivariate analysis. Significant predictors included the presence of diabetes, end-stage renal disease, hypertension, preoperative ambulatory status, level of vascular disease, and clinical presentation. However, when entering these significant factors into logistic regression, only the presence of end-stage renal disease and impaired ambulatory status at presentation independently predicted failure from the perspective of patient-centered outcomes derived from our prospective questionnaire (Table 5). Overall, 667 patients had neither end-stage renal disease nor impaired ambulation at baseline; 105 had end-stage renal disease, but not impaired ambulation; 138 had impaired ambulation, but no end-stage renal disease; and 44 had both end-stage renal disease and impaired ambulation. Alternatively stated, just over 30% of the cohort possessed at least 1 independent predictor of patient-centered outcomes failure.

Last, Table 6 shows the probability of achieving a patient-centered outcomes failure with and without the presence of independent patient predictors. While the probability of failure is 93% in patients with both impaired ambulatory status at presentation and end-stage renal disease, failure still occurs in 73% of patients without either predictor.

**Discussion**

Current interest in reforming the nation’s healthcare system compels investigators not only to discover novel therapies, but also better understand the outcomes of existing therapies. Treatment for vascular disease is no exception. In fact, the Institute of Medicine identified cardiovascu-
lar treatment as one of the national priorities for comparative effectiveness research.\(^4\) Comparative effectiveness research—the head-on-head comparison of proven therapies for the same illness, particularly considering value and reproducibility—and patient-centered outcomes research are growing funding priorities for national agencies such as the National Institutes of Health.\(^4\) This prioritization suggests an increasing awareness of discord between treatment capability and treatment effectiveness. Providers need practical parameters to help guide effective therapy, which is true for all types of surgery but particularly true for vascular intervention and chronic PAD of the lower extremities. For the past 4 decades, hundreds of studies documenting outcomes after arterial intervention for PAD have been published. Assessment typically focused on such parameters as arterial patency, limb salvage, and mortality. While these parameters are important, their technical nature often can fail to consider the perspective of the patient and do not account for patient comorbidities at presentation that might warrant modification of expectations. Previous analyses inform our perspective.\(^2\) Intrigued by an introspective and critical report from the University of Oregon where patients undergoing surgery for CLI experienced less favorable outcomes when endpoints became more patient centric,\(^5\) we considered nontraditional factors that might influence outcome in a series of 1000 consecutive interventions performed for CLI. We discovered intrinsic patient comorbidities, such as preoperative functional status, were as important as limb salvage to the functional outcome of patients being treated.\(^1\) Since our study, others have reported similar findings.\(^2\) Later, we reported quality-of-life data using the SF 36 survey in patients undergoing angioplasty for claudication and discovered that patient satisfaction was not necessarily dependent upon long-term arterial patency of the intervention.\(^7\) These findings, also observed by others, questioned whether the maintenance of arterial patency, considered by many to be the primary objective of all intervention, really determined success.\(^6,8,9\) Since then, we have learned that success may be variably defined and depends upon what outcomes are valued and from what perspective they are being considered—that of the physician, the patient, or society.

In 2009, we attempted to define successful outcome postintervention for tissue loss from the patient’s perspective, using a set of intuitive (albeit surgeon-derived) outcome measures. We defined success using 4 measures: 1) patency of vascular reconstruction to the point of wound healing, 2) limb salvage for 1 year, 3) maintenance of ambulation for 1 year, and 4) survival for 6 months.\(^10\) When applied to a cohort of 677 patients with CLI and tissue loss, success (measured as achieving all 4 parameters) was achieved in only 41% of cases. Independent predictors of failure included impaired ambulatory status at presentation, the presence of end-stage renal disease, diabetes, or gangrene, and prior vascular intervention. If all 5 predictors were present, success was achieved in fewer than 10% of cases. While this study helped inform decision making in our practice, there were several shortcomings. Most notably, the study team derived the outcome measures without patient input.

### Table 5
Odds ratios (OR) and 95% confidence intervals after logistic regression analysis of 10 factors found to be statistically significant in impacting success or failure during bivariate analysis.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>OR (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>1.21 (0.86-1.70)</td>
<td>.270</td>
</tr>
<tr>
<td>End-stage renal disease</td>
<td>2.21 (1.26-3.88)</td>
<td>.006</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.31 (0.90-1.91)</td>
<td>.164</td>
</tr>
<tr>
<td>Impaired ambulation</td>
<td>1.76 (1.12-2.79)</td>
<td>.015</td>
</tr>
<tr>
<td>Infrainguinal disease only</td>
<td>1.00 (Referent)</td>
<td>---</td>
</tr>
<tr>
<td>Suprainguinal disease only</td>
<td>1.42 (0.98-2.06)</td>
<td>.062</td>
</tr>
<tr>
<td>Both infra- and supra-inguinal disease</td>
<td>1.64 (0.74-3.66)</td>
<td>.225</td>
</tr>
<tr>
<td>Rest pain</td>
<td>1.00 (Referent)</td>
<td>---</td>
</tr>
<tr>
<td>Ischemic ulceration</td>
<td>0.85 (0.59-1.22)</td>
<td>.379</td>
</tr>
<tr>
<td>Gangrene</td>
<td>1.25 (0.80-1.98)</td>
<td>.329</td>
</tr>
</tbody>
</table>

### Table 6
The probability of failure and odds ratio for factors found to be independent predictors of failure to achieve patient-centered success after intervention for critical limb ischemia.

<table>
<thead>
<tr>
<th>Patient characteristic(s) present</th>
<th>Probability of failure (%)</th>
<th>Odds ratio of given profile compared to a “healthy” person</th>
</tr>
</thead>
<tbody>
<tr>
<td>(#1) End-stage renal disease</td>
<td>87.7</td>
<td>2.62</td>
</tr>
<tr>
<td>(#2) Impaired ambulation at baseline</td>
<td>83.4</td>
<td>1.85</td>
</tr>
<tr>
<td>#1 and #2</td>
<td>92.9</td>
<td>4.84</td>
</tr>
<tr>
<td>Baseline/“healthy” person</td>
<td>73.1</td>
<td>1.00</td>
</tr>
</tbody>
</table>
In this current analysis, we again attempt to measure success from the patient’s perspective, but presently employ success measures derived from the patient. When examining these success measures, we discovered that patients value functional or practical outcomes linked to quality of life. They desire problem resolution and pain-free mobility conducive to activities of daily living. When we quantified this into discernable metrics (pain relief, maintenance of mobility, avoidance of repeat doctor visits, maintenance of daily activities, and 1-year survival) and applied it to a cohort of 954 patients with CLI intervened upon for standard indications, we found that success occurred infrequently (only 23% of cases). The presence of end-stage renal disease and impaired ambulatory status at the time of presentation were independent predictors of failure. When both of these factors are present, the probability of failure exceeded 92%. These results suggest that if success were solely being judged by the patient, our contemporary outcomes leave considerable room for improvement.

This study has several practical and conceptual limitations. First, our study includes 2 distinct cohorts—a prospective cohort providing responses informing a separate/distinct and a retrospective cohort analysis. It is possible the 2 cohorts value different outcomes (or differentially value similar outcomes). Consequently, one may object to using one cohort’s responses to define surgery “success” for another. However, our analyses may provide a baseline for subsequent studies prospectively considering patient outcome values/preferences and actual outcomes within the same cohort. We additionally concede our survey tool lacked any validation. Ideally, our tool would benefit from a substantive pilot test to ensure question concordance between questions posed and constructs they purportedly represent. Indeed, our purported “patient-centered measures” originated from ideas and questions by the study team and not from the patient. While the answers might represent the wishes of the patients, the questions are certainly not without some bias despite all efforts to mitigate. Despite potential bias, ample opportunity was given for open-ended responses. Third-party study investigators administered the survey and patients were reassured that their answers were to be blinded to the treating surgeon. Consequently, while our measures may not be purely patient-centered, we believe the questionnaire has face validity and allows for subsequent psychometric scholarship to scrutinize its validity and utility.

Second, patient expectations, as derived via open-ended survey, may actually depict “patient hopes” as opposed to pragmatic “patient-centered outcomes.” Patients may hope for a painless intervention requiring no follow-up, but this goal is currently unrealistic, if not unattainable. Third, our study may employ an unduly rigorous definition of success. Achieving all 5 outcome measures, especially when one of the measures (no additional nonroutine physician visit) may include a disproportionate number of failures, may be too austere a measure to evaluate overall success. However, even if our analysis depicts results too pessimistically, the findings underscore several opportunities for improvement. For example, in this series 66% of patients undergoing elective vascular surgery did not solely rely on the advice of the surgeon, which highlights a potential education opportunity where the patient and surgeon may better discuss details of the patient’s current vascular condition and establish realistic expectations after surgery.

Another limitation includes potential discord between the patient population used to derive our patient-centered outcome criteria and the population in which we chose to apply these outcomes. This study surveyed patients with a variety of vascular problems, many of whom did not have lower extremity PAD. Our study population consisted solely of patients with CLI. It is reasonable to assume that our patient-centered outcome measures might have differed had the population surveyed been confined to patients with CLI. However, this reasoning may fail to solve the discord as well. It can be argued that “patients with CLI” may also be too generic a category. Perhaps it would have been best to sample patients with similar presenting symptoms (rest pain, ischemic ulcer, or gangrene). Same could be said for similar comorbidities or similar functional states.

This last study limitation highlights the general inadequacy of all literature looking at patient-centered outcomes. In reality, patient-centered outcomes is a “moving target” contingent upon the individual patient’s vacillating psycho-social state, environment, and disease progression. Consequently, it may be unsound practice to ever measure “blanket patient-centered outcomes” from one population and apply it to another. Future work addressing “successful patient-centered outcome” might best be achieved when analyzing patients individually—customized upfront and based on unique characteristics and circumstances at presentation. As an example, Lidsky and his colleagues published the outcomes from a series of patients with arteriovenous malformations (AVM) treated in a multidisciplinary fashion. While the study highlighted the work of a group of dedi-
SURGERY OVERLOOKS PATIENT-CENTERED OUTCOMES

cated physicians managing a difficult problem, the study’s most intriguing aspect arguably involved how success was measured. It was acknowledged with each patient up front that AVMs are not usually curable and that palliation is often the treatment goal. Conditioned upon that understanding, the physician and the patient subsequently determined the optimal achievable outcome for each case. If that outcome was achieved, then the patient and provider deemed the overall outcome successful. Realistically, PAD of the lower extremities is a multifaceted, debilitating condition that is probably no more curable than a vascular malformation. Palliation is almost always the goal. It is conceivable that targeted results involving physician-centered, society-centered, and patient-centered outcomes could be discussed with each patient and determined prior to intervention. Similar to the Lidsky study, if that result is achieved, then the overall treatment should be considered successful. There is evidence in our data to support this. Counter to what most vascular surgeons might expect, nearly 5% of patients in our study reported achieving patient-centered success despite having a major lower extremity amputation. Had the physician and the patient decided preoperatively that amputation was the best achievable goal, then perhaps a shared satisfactory outcome could have been targeted, vascular intervention could have been avoided, and a less complex, more cost-effective treatment plan could have been implemented.

Conclusion

In summary, this study is intended to introduce the concept of patient-centered outcomes as an important consideration in the management of patients undergoing planned surgery. Our findings suggest that patients undergoing vascular intervention desire pain control, maintenance of daily activity, maintenance of mobility, and the minimization of trips to the doctor. When we applied these desired outcomes to a cohort of patients undergoing treatment for CLI using standard indications, we achieved overall patient-centered success in fewer than 25% of cases. Patients with end-stage renal disease and significant physical debility at presentation were at significantly higher risk for poor outcome. These data support the premise that overall outcome success might best be derived by a blend of physician, patient, and society-centered goals tailored to the individual, after fully discussing and understanding treatment limitations, as well as patient-specific factors impacting satisfaction with the surgical outcome.

References


Abbreviations and Acronyms

CLI = critical limb ischemia
GHS = Greenville Health System
PAD = peripheral arterial disease
ABI = ankle-brachial index
OR = odds ratio
AVM = arteriovenous malformation

Correspondence

Address to: Dr. Spence M. Taylor Greenville Health System, Memorial Campus Health Sciences Administration Building 701 Grove Rd, Greenville, SC 29605 (staylor@ghs.org)