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Article

Patients Differ from Surgeons in Their Perceptions of Common Donor Site Morbidity Problems after Anterior Cruciate Ligament (ACL) Reconstruction Surgery

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Abstract: Introduction: Understanding individual patient expectations and aspirations around the time of Anterior Cruciate Ligament Reconstruction (ACLR) surgery is paramount to delivering quality medical care that leads to patient satisfaction. Patients, influenced by a variety of sources, are likely to have different expectations about return to sport, persistent knee symptoms, clinical graft failure and reoperation than their surgeon. The purpose of this study was to evaluate which clinical outcomes and potential complications patients consider most important in defining success after ACLR, and to compare these priorities with those of surgeons. Methods: We established the Exploring Patient and Healthcare Worker Expectations in ACL Surgery (Expect-ACL) study to investigate expectations and perspectives surrounding ACL surgery. The Expect-ACL study utilised a cross-sectional survey design distributed to (1) surgeons and (2) patients who were a minimum 12 months after a primary ACLR. Results: We received completed surveys from 49 knee surgeons and 55 adult ACL patients. Patients prioritised "Lowest risk of re-injury" higher than surgeons (median rank 3 vs. 5, $p = 0.012$). Patients considered persistent hamstring and quadriceps weakness, reduced knee flexion and donor site pain to be more problematic than surgeons. A higher proportion of surgeons considered graft re-rupture to be problematic. Conclusions: Patients' and surgeons' expectations following ACLR differed in important ways. Patients were more concerned about experiential aspects, whereas surgeons were more likely to prioritise outcomes related to the patients' surgical knee.

Keywords: anterior cruciate ligament reconstruction; donor site morbidity; rehabilitation; expectations; patient; surgeon; return to sport

1. Introduction

Anterior cruciate ligament (ACL) injury is common amongst active individuals and much literature has been published around reconstructive graft choice, surgical planning and delivery, rehabilitation and return to sport [1–3]. Clinical failure, defined in the STABILITY trial as a composite of graft rupture requiring revision ACL reconstruction or symptomatic rotational instability with a positive pivot shift examination, has been reported to be as high as 40% and is associated with significant clinical morbidity and psychological stress [3]. Surgeons continue to debate optimal graft choice, position of tunnels, fixation methods as well as rehabilitation protocols in an effort to prevent failure of Anterior Cruciate Ligament Reconstruction (ACLR) and improve patient outcomes [4].

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Understanding individual patient expectations and aspirations around the time of ACLR is paramount to delivering quality medical care that leads to patient satisfaction. Patients, influenced by a variety of sources, are likely to have different expectations about return to sport, persistent knee symptoms, clinical graft failure and reoperation than their surgeon [5,6]. Successful ACLR has been framed by surgeons and researchers using clinical and structural metrics such as radiographic metrics, clinical graft integrity, objective knee laxity measures and clinical failure rates [5]. Furthermore, widely used patient reported outcome measure (PROM) instruments (IKDC, KOOS, Lysholm) designed, selected and validated by clinicians and researchers do not capture the patient experience during their episode of care [7].

ACL literature highlights that patient priorities often differ from surgeon expectations. Marmura et al. [5] demonstrated that while both surgeons and patients rated instability and reinjury risk as important, patients focused more on lifestyle (return to work/school) and sport-related outcomes, whereas surgeons emphasised risk mitigation (graft rupture, instability and osteoarthritis). Patients prioritise their surgeon's preference in decisions about graft choice, but are also informed from personal research, friends and team-mates [6]. Using modern shared decision-making principles in discussions about the potential negative consequences of ACLR can help bridge the gap between evidence-based medicine and patient centred care [8–11].

There has been a broader trend in orthopaedics to develop stakeholder informed outcome measures that better conceptualise the patient experience [12,13]. Narayanan et al. [14] developed the GOAL-LD (Gait Outcomes Assessment List for Lower-Limb Differences), an outcome measure which prioritised patient and family goals in determining the success of an intervention managing paediatric lower limb deformities and discrepancies. By incorporating a "priority framework", the GOAL-LD allowed patients and families to identify which outcomes mattered most to them, facilitating individualised goal-setting and shared decision-making around the timing and choice of intervention. No comparable stakeholder derived framework currently exists to define a successful outcome following ACLR [15]. Our study aims to apply these principles in understanding how different stakeholders define a successful ACLR.

The purpose of this study was to evaluate which clinical outcomes patients consider most important in defining success after ACLR, and to compare these priorities with those of surgeons. This study also aims to understand differences in the perceived morbidity of a breadth of potential complications between patients and surgeons. We hypothesised that surgeons would emphasise technical outcomes and graft integrity, whereas patients would assign greater importance to functional recovery, return to sport, and avoidance of donor-site morbidity.

2. Methods

The study was approved by Human Research Ethics Committee of Northern Sydney Local Health District (NSLHD reference: HREC/17/HAWKE/140).

We established the Exploring Patient and Healthcare Worker Expectations in ACL Surgery (Expect-ACL) study to investigate expectations and perspectives surrounding ACL surgery. This study utilised a cross-sectional survey design distributed to surgeons, physiotherapists, sports physicians, general practitioners, adult ACL patients and parents of paediatric ACL patients. The present study utilised data from two population groups (surgeons and adults ACL patients) only. Study data were collected and managed using REDCap electronic data capture tools hosted at Sydney Orthopaedic Research Institute (SORI) [16,17]. The populations sampled included (1) patients who were a minimum 12 months post ACLR and (2) local and international orthopaedic surgeons. These patients were identified from our institutional database at SORI in Sydney, Australia. Patients were invited via an email generated by the institutional REDCap database or approached to complete the survey during clinic visit. Patients were deemed eligible if they had a primary ACLR within the past 5 years and were a minimum 12 months after ACLR. Exclusion criteria included patients who were scheduled for, or had undergone, a revision ACLR, or had an ACLR as part of a multi-ligament injury. The (2) surgeon survey was distributed via the Australian Knee Society (AKS) newsletter, as well as via a poster at the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS) biannual meeting in Munich 2025. Orthopaedic surgeons with an active practice who regularly perform ACLR were asked to participate. No demographic data was recorded, patients were not requested to state the graft used in their ACLR, and surgeons were not asked their usual graft preference when performing ACLR.

There is no published validated scale available that appropriately captures the perceptions of outcomes and morbidities after ACLR to allow comparisons between patients and surgeons. In the context of this study, a survey instrument was developed. The survey asked responders to rank (most important to least important) nine broad categories labelled "Factors leading to a successful ACLR", encompassing return to sport, pain, knee stability, range of motion and strength, imaging findings and time to play. Responders were then presented with a range of

commonly occurring outcomes related to donor site, strength and range of motion, pain, re-rupture and asked to indicate the importance of each on a five-point Likert scale from "not problematic" to "extremely problematic". In addition, patients were asked to rank on a five-point Likert scale ("no influence" to "most influential") how a variety of sources would influence their decision on graft choice. The survey instrument was developed and reviewed by a focus group comprising four knee surgeons, a lead non-surgeon researcher, a statistician, and a patient representative. The group reviewed the survey to ensure that the questions were relevant to the research question, captured the breadth of patients' ACLR experiences, and were clear and easy to understand. No formal validity or reliability testing of the survey instrument was performed. As such, the survey data and any comparisons between patients and surgeons should be considered exploratory and are not intended to establish causal relationships.

3. Statistical Analysis

3.1. Ranked Priority

The survey first asks respondents to prioritise nine ACLR outcomes from most important to least important. Ranking responses were analysed using descriptive statistics. For each outcome, the distribution of ranks was summarised by the median (as a measure of central tendency) and the interquartile range (as a measure of agreement). Outcomes with a lower median score were interpreted as being considered more important. Results were presented as a ranked priority list separately for patients and surgeons and then compared to identify differences in prioritisation. The Mann-Whitney U test, for ordinal data, identified areas where there were significant differences between cohorts.

3.2. Measurement of Perceived Outcome Importance

The second part of the survey used a five-point Likert scale to gauge the perceived importance of common comorbidities in ACLR. The primary analysis focused on identifying outcomes regarded as problematic rather than detecting shifts across the full ordinal response distribution. Accordingly, Likert responses were then dichotomised as higher perceived morbidity ("very problematic" and "extremely problematic") and lower perceived morbidity ("not problematic", "minimally problematic" and "moderately problematic") to provide interpretable effect estimates. A binary logistic regression analysis was used to compare the odds of rating each outcome as higher perceived morbidity ("very problematic" and "extremely problematic") between patient and surgeon cohorts. Results are presented as odds ratios (OR) with 95% confidence intervals (CI) and associated *p*-values. No adjustment was made for potential confounders or covariates; therefore, these comparisons should be considered exploratory.

3.3. Sample Size

This study is designed to be exploratory in nature only and does not determine causality. No formal sample size analysis was performed. All complete responses received were included in the analysis and are presented.

4. Results

We received completed surveys from 49 knee surgeons and 55 adult ACL patients.

4.1. Ranked Priority

Ranked priority lists of the two cohorts are shown in Table 1. Patients prioritised "Lowest risk of re-injury" higher than surgeons ($p = 0.012$). There were no statistically significant differences in median rankings for all other outcomes.

Table 1. Ranked factors of successful ACLR comparing patient with surgeon cohorts. A lower median score represents higher priority.

Outcome	Patients	Surgeons	*p* Value
	Median (Q1–Q3)	Median (Q1–Q3)	
Lowest risk of re-injury	3 (1–5)	5 (3–7)	0.012
Knee has no reported pain or discomfort	3 (2–5)	3 (2–5)	0.403
Return to sports at the same pre-injury standard	3 (1–6)	2 (1–4)	0.499
Knee feels stable on doctor's examination	4 (3–6)	3 (2–5)	0.233
Return to any sports (below preinjury level)	4 (3–6)	4 (3–5)	0.133
No noticeable lower limb weakness	6 (4–7)	6 (5–7)	0.116
Symmetrical range of motion (within 5 deg of normal knee)	6 (5–7)	5 (4–6)	0.091
Intact ACL graft can be seen on MRI scan	7 (3–8)	7 (6–8)	0.669
Fastest possible return to my sport	8 (7–9)	9 (7–9)	0.424

4.2. Measurement of Perceived Outcome Importance

Responses to survey questions are shown in Table 2. When morbidity items were dichotomised as higher perceived morbidity ("Very" or "Extremely problematic") versus lower perceived morbidity ("Not", "Minimally" or "Moderately problematic"), patients were more likely than surgeons to rate several functional and performance-related sequelae as problematic. Patients considered strength related deficits to be of higher perceived morbidity; mild persistent hamstring weakness (OR = 27.43, $p = 0.002$), mild persistent quadriceps weakness (OR = 5.03, $p = 0.007$) and lower limb weakness with no impact on function (OR = 4.62, $p = 0.011$). Patients also considered several sport related outcomes to be of higher perceived morbidity; pain at location of ACL harvest during sports (e.g., hamstrings, quadriceps, patella) (OR = 3.44, $p = 0.007$), and reduced peak sprint velocity (OR = 2.29, $p = 0.087$), although the latter did not reach statistical significance. In contrast, both groups considered ACL graft re-rupture as being higher perceived morbidity, though this proportion was higher in the surgeon cohort (OR = 0.06, $p = 0.008$).

Table 2. Measurement of perceived outcome importance. Survey questions are presented as distributed to both cohorts. Lower perceived morbidity = Not problematic, Minimally problematic, or Moderately problematic; Higher perceived morbidity = Very problematic or Extremely problematic. Binary logistic regression models higher concern, with surgeons as the reference group; OR > 1 indicates greater odds among patients. OR = odds ratio; CI = confidence interval.

Patients		**Surgeons**		**Binary Logistic Regression**	
Lower Perceived Morbidity n (%)	**Higher Perceived Morbidity n (%)**	**Lower Perceived Morbidity n (%)**	**Higher Perceived Morbidity n (%)**	**OR (95% CI)**	***p* Value**
Unable to return to sport at the same pre-injury level					
24 (43.6)	31 (56.4)	26 (53.1)	23 (46.9)	1.46 (0.67–3.17)	0.338
Reduced peak sprint velocity					
38 (69.1)	17 (30.9)	41 (83.7)	8 (16.3)	2.29 (0.89–5.92)	0.087
Speed of rehab: Slower initial phase recovery (no stationary bike until after 8 weeks post surgery)					
50 (90.9)	5 (9.1)	48 (98.0)	1 (2.0)	4.80 (0.54–42.60)	0.159
Speed of rehab: Slower initial phase recovery (no jogging until 16 weeks post surgery)					
49 (89.1)	6 (10.9)	48 (98.0)	1 (2.0)	5.88 (0.68–50.67)	0.107
Lower limb weakness with no impact on function					
39 (70.9)	16 (29.1)	45 (91.8)	4 (8.2)	4.62 (1.42–14.97)	0.011
Strength: Mild persistent quads weakness (10% less than the healthy knee)					
38 (69.1)	17 (30.9)	45 (91.8)	4 (8.2)	5.03 (1.56–16.24)	0.007
Strength: Mild persistent hamstring weakness (10% less than healthy knee)					
35 (63.6)	20 (36.4)	48 (98.0)	1 (2.0)	27.43 (3.51–214.15)	0.002
Range of motion: Unable to achieve symmetrical knee extension (straightening) (5 degrees less than healthy at end range)					
32 (58.2)	23 (41.8)	27 (55.1)	22 (44.9)	0.88 (0.41–1.92)	0.752
Range of motion: Unable to achieve symmetrical deep knee flexion (bending) (10 degrees less flexion than the healthy knee at end range)					
32 (58.2)	23 (41.8)	41 (83.7)	8 (16.3)	3.68 (1.46–9.32)	0.006
ACL graft re-rupture					
14 (25.5)	41 (74.5)	1 (2.0)	48 (98.0)	0.06 (0.01–0.48)	0.008
Doctor feels mild knee laxity; patient reports feeling stable in daily life					
44 (80.0)	11 (20.0)	45 (91.8)	4 (8.2)	2.81 (0.83–9.50)	0.096
Occasional knee pains (generalised aches)					
46 (83.6)	9 (16.4)	47 (95.9)	2 (4.1)	4.60 (0.94–22.44)	0.059
Discomfort: Pain at location of ACL harvest during sports (e.g., hamstring, quadriceps, patella)					
31 (56.4)	24 (43.6)	40 (81.6)	9 (18.4)	3.44 (1.40–8.45)	0.007
Discomfort: Pain while kneeling on hard surfaces					
34 (61.8)	21 (38.2)	39 (79.6)	10 (20.4)	2.41 (1.00–5.82)	0.051
Knee regularly clicks or cracks					
43 (78.2)	12 (21.8)	44 (89.8)	5 (10.2)	2.46 (0.80–7.56)	0.117
Size of surgical scar					
54 (98.2)	1 (1.8)	48 (98.0)	1 (2.0)	0.89 (0.05–14.60)	0.934
Patches of permanent numb skin over anterior knee or shin					
51 (92.7)	4 (7.3)	48 (98.0)	1 (2.0)	3.76 (0.41–34.89)	0.243
Return to operating theatre for any reason (e.g., meniscus tear, manipulation for stiffness, etc)					
20 (36.4)	35 (63.6)	16 (32.7)	33 (67.3)	0.85 (0.38–1.91)	0.691

4.3. Influences on Patient Decision Making

Patients report a wide range of external influences when deciding on graft choice in their ACLR (Figure 1). The treating surgeon is the dominant source of guidance (78.2% highly significant influence, 20% significant influence). Patients also consider their physiotherapist (54% highly significant or significant influence), as well as a moderate influence from peers who have undergone ACLR (7.3% significant influence, 30.9% some influence).

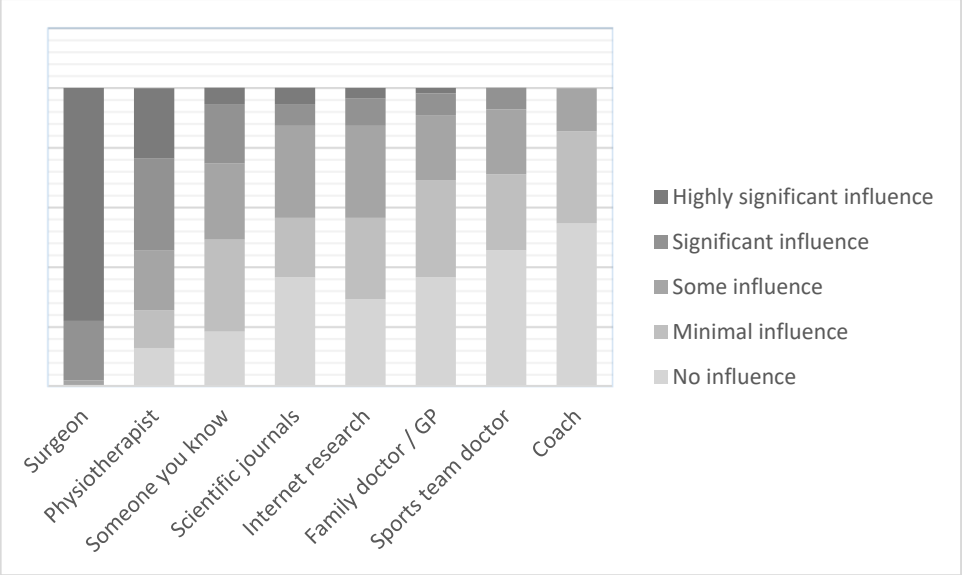


Figure 1. Patients' rating sources of influence in their decision making around graft choice.

5. Discussion

The present study provides an exploratory analysis of how surgeons and patients differ in their perceptions on ACLR outcomes and morbidities. Overall, both patients and surgeons prioritised return to activity at a preinjury level and postoperative pain as top priorities after ACLR. Both cohorts also placed lowest significance on radiological integrity of the graft and the time taken to return to sporting activities [Table 1].

A key finding of our study is that patients were more likely to consider mild quadriceps and hamstrings weakness to be problematic, even when these deficits did not impact function. Patients also considered sporting activity related pain at the donor site to be of higher perceived morbidity. These findings echo biomechanical and patient-reported data showing that strength deficits and activity related discomfort may persist long after the rehabilitation period and significantly affect athletic performance [18–20]. Baez et al. showed that the presence of persistent knee symptoms after ACLR was associated with decreased psychological readiness to return to sport, fear of reinjury and lower score on the Knee injury and Osteoarthritis Outcome Score—Quality of Life (KOOS-QOL) subscale [20].

Patients prioritised "lowest risk of re-injury" higher than surgeons (median 3rd vs. 5th, $p = 0.012$) [Table 1] when ranking the importance of outcomes after ACLR. Surgeons, however, were more likely to consider "ACL graft re-rupture" to be of higher perceived morbidity ("Very" or "Extremely problematic") (74.5% vs. 98.0%, OR = 0.06, $p = 0.008$). The patients' concerns reflect an experiential framing of re-injury, whereas surgeons considered a structural and technical paradigm of clinical failure. Marmura et al. [5] using a survey based model comparing surgeon and patient priorities also found that surgeons emphasised graft integrity and instability whereas patients were more likely to prioritise lifestyle and sporting outcomes.

Previous surveys on patients' selection of ACLR graft have shown the most influential factor to be the operating surgeon [5,6]. Our study confirms this finding (98.2% significant or highly significant influence). In addition, patients also value the opinions of their physiotherapist and "someone they know" who has previously had an ACLR and has advised the patient on their experiences. Perhaps identifying the patient's pre-consultation discussions with other stakeholders is a key part of the discussion and combined decision-making process to ensure high rates of patient satisfaction. Given the reliance patients place on their surgeon in decision making, surgeons should consider the experiential aspects of rehabilitation; discomfort, persisting weakness, donor site pain and return to sport; in addition to discussions on re-rupture risks and other technical aspects of surgery. Based on these discussions, surgeons should consider graft choice on an individual basis [21,22].

The strength of this study is that it uses parallel surveys across two stakeholder groups to gauge perceptions of morbidity and success after ACLR. We sampled both local and international surgeons through the AKS and ISAKOS, improving generalisability. It builds upon work within other orthopaedic domains that have shifted towards stakeholder derived outcome assessment [14].

We acknowledge several factors that limit the strength of the study. Our patient cohort was drawn from a single institution, whilst surgeons were recruited across both local and international specialty societies. There may exist geographic and cultural differences in healthcare expectations that may confound the observed disparities. Our single institution treats recreational and elite athletes, who may have differing expectations around return to sport and morbidities, potentially limiting generalisability of findings. This study included patients who were a minimum 12 months after ACLR, but excluded patients who had received, or were awaiting, a revision ACLR. Patients undergoing revision ACLR may have different priorities, particularly around graft re-rupture and re-injury risk, compared to patients who have had a successful primary ACLR.

Demographic characteristics, graft details and surgeon-specific preferences were not collected and therefore could not be accounted for in the analyses. However, these factors were not objectives of the study, which was designed as an exploratory investigation and did not aim to establish causal relationships. The survey was not subjected to formal validity or reliability testing; further evaluation of the survey instrument, including formal validation, is warranted in future research.

It is possible that patients and surgeons interpret commonly used terms such as “laxity”, “re-injury”, and “re-rupture” in dissimilar ways. Likert responses were dichotomised as “higher perceived morbidity” and “lower perceived morbidity” during the post-survey analysis to draw interpretable effect estimates; however, it is possible that other cutoff thresholds yield different results.

6. Conclusions

Patients and surgeons differ in their priorities after ACLR. Patients were more concerned about experiential aspects (risk of reinjury, hamstring and quadriceps weakness, loss of flexion, pain at donor site), whilst a higher proportion of surgeons expressed concerns around the patients’ surgical knee (graft re-rupture). Both patients and surgeons consider returning the pre-injury level of sport to be the top priority after ACLR. Orthopaedic surgeons may use these results to tailor their discussions with patients undergoing ACLR around graft choice and expected recovery.

Author Contributions

T.A.S.: Participant recruitment, data curation, survey formation, statistical analysis, writing—original manuscript, visualisation; S.K.: Data curation, statistical analysis, writing—editing and reviewing; H.A.: Conceptualisation, methodology, software/survey formation and distribution, statistical analysis, writing—editing and reviewing; V.B.: Statistical analysis, validation, writing - review & editing; A.S.N.: Conceptualisation, methodology, software/survey formation, writing—reviewing and editing, supervision. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was approved by Human Research Ethics Committee of Northern Sydney Local Health District (NSLHD reference: HREC/17/HAWKE/140, approved on 20 September 2017, and an amendment for a five year extension on 13 October 2022.)

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data supporting the findings of this study are not publicly available due to participant confidentiality, privacy considerations and restrictions under the approved ethics and consent arrangements. Requests for access to de-identified data may be directed to the Sydney Orthopaedic Research Institute and will be considered on a case-by-case basis, subject to institutional approval and applicable ethical requirements.

Conflicts of Interest

Alexander S. Nicholls reports a relationship with Smith and Nephew: funding for Orthopaedic fellowship position. The other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Use of AI and AI-Assisted Technologies

No AI tools were utilized for this paper.

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