The Knee 60 (2026) 104390

Contents lists available at ScienceDirect

The Knee

journal homepage: www.elsevier.com/locate/thekne

The Paediatric ACL National Audit (PANA) study: a multicentre review of UK practice and adherence to BOAST guidelines

Benjamin D. Gompels [a], Alagu Subramanian [a], Ilias E. Epanomeritakis [a], Daniel Hide [a], Michael Daniel Collins [a], Thomas Molloy [a], Florence Bradshaw [a], Simone Castagno [a], Ignatius Liew [a], William Nabulyato [a], Chinmay Gupte [b], Nicolas Nicolaou [c], Stephen M. McDonnell [a,*], PANA Collaborative Group [†]

[a] University of Cambridge, Department of Surgery, Division of Trauma and Orthopaedic Surgery, Box 180 Addenbrooke's Hospital, Cambridge Biomedical Campus, Cambridge CB2 0QQ, United Kingdom
[b] Department of Surgery & Cancer, Imperial College London, Hammersmith Hospital, Du Cane Road, London W12 0NN, United Kingdom
[c] Department of Orthopaedics, Sheffield Children's NHS Foundation Trust, Western Bank, Sheffield, South Yorkshire S10 2TH, United Kingdom

ARTICLE INFO

Article history:
Received 4 August 2025
Revised 2 February 2026
Accepted 4 February 2026

Keywords:
Anterior cruciate ligament
Paediatric orthopaedics
BOAST guidelines
Surgical pathways
Multidisciplinary care
National audit

ABSTRACT

Background: Paediatric ACL injuries are increasingly common and present significant challenges. Inappropriate treatment can lead to long-term complications like instability, growth disturbance, and osteoarthritis. The Paediatric ACL National Audit (PANA) Study assesses UK practices and adherence to Best Orthopaedic Practice (BOAST) guidelines for managing these injuries, identifying opportunities to improve care for young patients.

Methods: PANA was a collaborative audit of 22 hospitals in England, Wales, and Scotland, measuring adherence to BOAST guidelines in treating paediatric ACL injuries. Orthopaedic surgeons and trainees collected data through a secure online questionnaire about service provision for skeletally immature patients, including diagnostic imaging, rehabilitation, post-operative follow-up, and surgical techniques.

Results: Our analysis revealed variability in adherence to the BOAST guidelines for ACL injuries in paediatric patients, with 65% of centres using acute knee pathways and 68% utilising collaborative imaging pathways. About 59% of centres conduct radiological growth monitoring, while only 30% report functional outcomes. Less than 50% report re-rupture rates, and 74% adhere to rehabilitation protocols.

Conclusion: The rise in ACL injuries in the paediatric population highlights the need for standardised care delivery and reporting. Following the release of the BOAST guidelines in 2022, this nationwide audit has revealed discrepancies in UK practices. A multidisciplinary approach is essential for improving patient care and outcomes by standardising and promoting best practice.

* Corresponding author.
E-mail addresses: bdg30@cam.ac.uk (B.D. Gompels), as3568@cam.ac.uk (A. Subramanian), iee21@cam.ac.uk (I.E. Epanomeritakis), dh670@cam.ac.uk (D. Hide), dmc72@cam.ac.uk (M.D. Collins), tm766@cantab.ac.uk (T. Molloy), feb45@cam.ac.uk (F. Bradshaw), sc2257@medschl.cam.ac.uk (S. Castagno), isyl2@cam.ac.uk (I. Liew), WillNabulyato@gmail.com (W. Nabulyato), c.gupte00@imperial.ac.uk (C. Gupte), nicolas.nicolaou3@nhs.net (N. Nicolaou), sm2089@cam.ac.uk (S.M. McDonnell).
[†] The collaborators of PANA Collaborative Group are listed in the Appendix A.

https://doi.org/10.1016/j.knee.2026.104390

1. Introduction

Anterior cruciate ligament (ACL) injuries are a significant source of morbidity and functional impairment in the paediatric population, with significant short- and long-term consequences [1]. These injuries, often caused by non-contact mechanisms such as pivoting or landing, are becoming more prevalent due to increased participation in organised sports and intensive training from a young age [1,2]. If not properly managed, paediatric ACL injuries can lead to recurrent instability, meniscal and cartilage damage, and early-onset osteoarthritis [2]. The unique challenges of treating skeletally immature patients include avoiding physeal damage while ensuring joint stability [3].

The literature shows the importance of timely diagnosis and individualised treatment approaches, ranging from structured rehabilitation for partial tears to surgical reconstruction for complete ruptures, to mitigate risks of growth disturbances and optimise functional outcomes [1,3,4]. Adherence to evidence-based guidelines is crucial for optimising patient outcomes and improving the quality of care.

The Paediatric ACL National Audit (PANA) Study was undertaken to evaluate current practices among healthcare providers in the United Kingdom in managing ACL injuries in skeletally immature patients. The primary objective was to identify variations in practice and pinpoint areas for potential improvement in the care of this vulnerable population.

This paper presents the findings of the PANA Study, which specifically examined adherence to the Best Orthopaedic Practice (BOAST) guidelines for managing paediatric ACL injuries [5]. First published in May 2022, these guidelines outline recommendations for various aspects of care, including diagnosis, treatment modalities, surgical techniques, rehabilitation strategies, and follow-up protocols [5].

This study compared current clinical practice with the BOAST guidelines to evaluate paediatric ACL injury management across the UK. It identifies gaps in adherence, areas for improvement, and opportunities to refine care delivery. These findings can inform the development of targeted interventions and updated guidelines, aiming to improve outcomes for skeletally immature patients affected by ACL injuries.

2. Methods

This national audit was registered at the national level through the host institution (Cambridge University Hospital) and approved by the British Society for Children's Orthopaedic Surgery (BSCOS), British Association for Surgery of the Knee (BASK), and the British Orthopaedic Association (BOA). The Qualtrics (USA) secure online questionnaire platform was utilised to collect data from participating trusts. Audit leads for each trust registered the audit locally and completed the online questionnaire. Audit leads could be any registered healthcare practitioner involved in the care of paediatric ACL injuries; however, it was predominantly completed by orthopaedic trainees and consultant orthopaedic surgeons.

To maximise the circulation of the questionnaire, it was presented at the East Anglia Paediatric Orthopaedic Group Meeting (EAPOG) by BG and at the International Kids Knee Conference in Sheffield in 2024 by the BASK Research Lead, SMC. Students and trainees distributed cards with QR codes at these events to collect participant details and maximise the number of respondents. In addition, the survey link was sent to the BSCOS and BOTA mailing lists via email to further increase participation.

The questionnaire assessed adherence to BOAST guidelines for managing paediatric ACL injuries. It collected data on diagnosis, treatment modalities, surgical techniques, rehabilitation protocols, and follow-up practices. A copy of the online questionnaire is available in Appendix 1.

The collected responses were compiled and analysed to assess compliance with the BOAST guidelines.

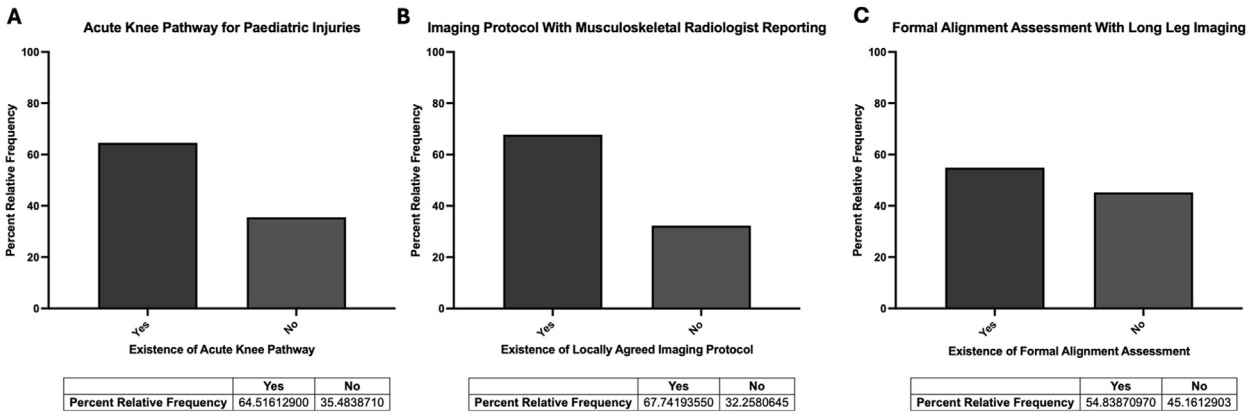
3. Results

3.1. Centres and acute knee pathways

Our audit encompassed 22 centres, distributed among England (20), Scotland (1), and Wales (1). The questionnaire, completed by 31 doctors, evaluated various aspects of managing paediatric ACL injury, including diagnosis, treatment modalities, surgical techniques, rehabilitation protocols, follow-up practices, and data analysis. Within some centres, there was intra-hospital variation between surgeons.

Of the centres studied, 65% (n = 20/31) had an acute knee pathway for paediatric ACL injury, whereas 35% (n = 11/31) had no pathway in place (Figure 1). Regarding imaging, 68% (n = 21/31) had a locally agreed-upon imaging protocol, while 32% (n = 10/31) did not have an agreed-upon imaging protocol. Within some centres, there was variation within the hospital.

The BOAST guidelines recommend that all children considered for ACL reconstruction undergo and document an assessment of their remaining growth. Among the assessment methods utilised, 4 out of 31 centres employed wrist radiographs and bone age evaluations, while 2 used X-rays and seven relied solely on bone age. Other centres applied established skeletal age assessment methods, including the Greulich and Pyle atlas method (3 out of 31), Tanner-Whitehouse (2 out of 31), and the Multiplier method (2 out of 31). Additionally, two centres estimated growth using a 'rule of thumb', and six clinicians reported that they did not formally assess remaining bone growth at their facilities.



	Yes	No
Percent Relative Frequency	64.51612900	35.4838710

	Yes	No
Percent Relative Frequency	67.74193550	32.2580645

	Yes	No
Percent Relative Frequency	54.83870970	45.1612903

Figure 1. Assessment of acute knee pathway components across UK centres. Bar graphs showing the proportion of centres that have implemented (A) a dedicated acute knee pathway for paediatric injuries, (B) an imaging protocol with musculoskeletal radiologist reporting, and (C) formal alignment assessment using long leg imaging. Data was presented as a percentage relative to the frequency of responding centres.

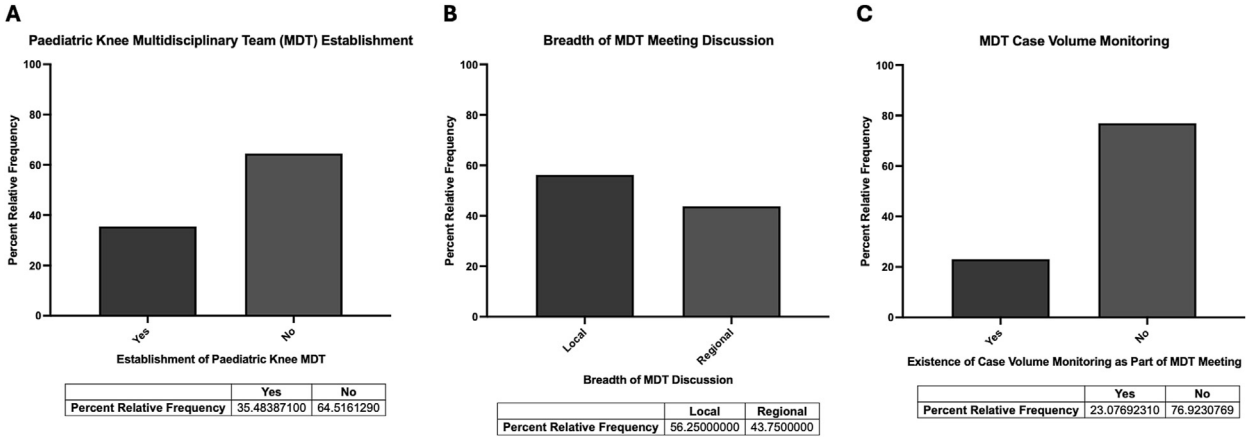
3.2. Case volume and treatment planning

Among the centres evaluated, 35% (n = 11/31) have established a Paediatric Knee Multidisciplinary Team (MDT) within the trust (Figure 2). Furthermore, 55% (n = 6/11) of those centres with MDTS reported that case volume monitoring is included in their MDT meetings.

The mean wait time for MRIs in the centres studied ranged from one week (8/31) to eight weeks (1/31), with the following frequencies: two weeks (9/31), three weeks (5/31), four weeks (4/31), and five weeks (1/31) (Figure 3). One centre stated that their wait time was ad hoc. Some responses specified the wait times for urgent and routine scans. The urgent scan wait times ranged from one week (2/28), 1.5 weeks (1/31), and two weeks (2/28). The routine wait times listed were three weeks (1/31), six weeks (1/31), seven weeks (1/31) and several months (1/31).

The surgeons conducting soft tissue knee surgeries at these centres were evaluated (Figure 4). Adult knee surgeons performed 55% (n = 16/29) of the surgeries, while paediatric surgeons were responsible for 24% (n = 7/29). Combining both types of surgeons accounted for 21% (n = 6/29).

The adequacy of treatment pathways was assessed based on access to appropriate paediatric operating rooms, perioperative care, and ward facilities. Among the centres evaluated, 79% (n = 23/29) indicated they had an adequate treatment pathway for accessing the necessary paediatric operating rooms, perioperative care, and ward facilities to prevent treatment delays. Conversely, 21% (n = 6/29) of the centres reported a lack of sufficient treatment pathways, highlighting an ongoing necessity for enhancements in this area for a minority of centres. Furthermore, 39% (n = 11/28) of centres stated that a locally agreed-upon protocol for non-operative management was established and subject to ongoing review, while 61% (n = 17/28) did not.

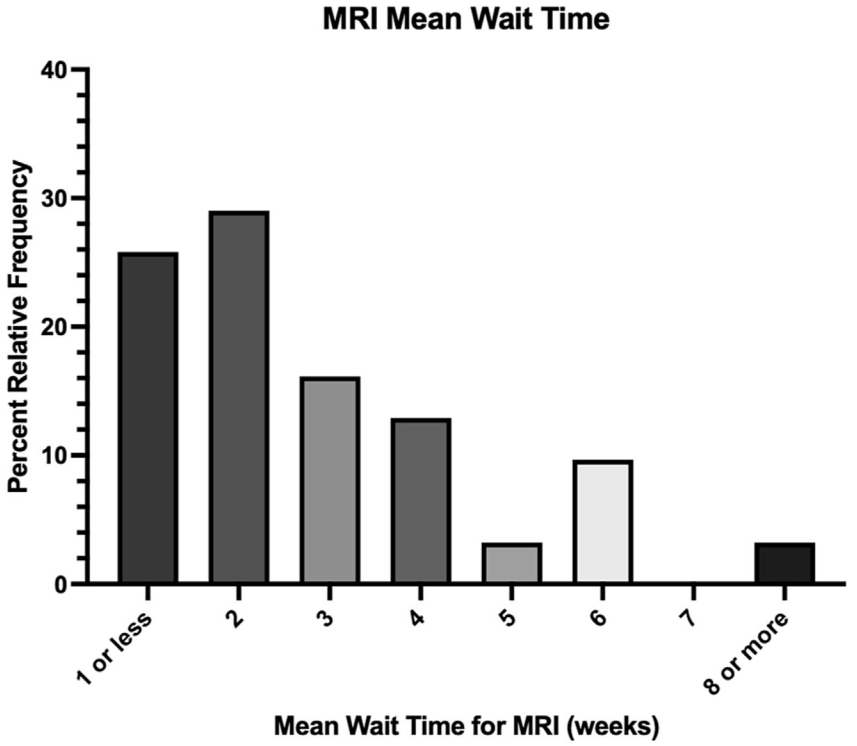


	Yes	No
Percent Relative Frequency	35.48387100	64.5161290

	Local	Regional
Percent Relative Frequency	56.25000000	43.7500000

	Yes	No
Percent Relative Frequency	23.07692310	76.9230769

Figure 2. Multidisciplinary team (MDT) structure and function across UK centres. Bar graphs demonstrating (A) establishment of dedicated paediatric knee MDTs, (B) geographical scope of MDT case discussions, and (C) implementation of case volume monitoring within MDT meetings. Data represented as percent relative frequency of responding centres.



Number of Weeks	1 or less	2	3	4	5	6	7	8 or more
Percent Relative Frequency	25.80645160	29.0322581	16.1290323	12.9032258	3.22580645	9.67741935	0	3.22580645

Figure 3. Mean wait times for paediatric knee MRI across UK centres. Bar graph showing the per cent relative frequency of mean MRI wait times in weeks.

The audit included an evaluation of the availability of various locally agreed referrals, transition care, and rehabilitation pathways that ensure quality care within the context of surgical intervention as per BOAST. Among the centres examined, 43% (n = 12/28) had established referral pathways for the management of growth disturbances, while 57% (n = 16/28) did not have formal pathways. Furthermore, 39% (n = 11/28) of centres indicated having a locally agreed pathway for the transition from paediatric to adult care, whereas 61% (n = 17/28) lacked formal transition pathways. Of the centres audited, 74% (n = 20/27) had dedicated rehabilitation pathways, in contrast to 26% (n = 7/27) which did not have standardised rehabilitation protocols.

3.3. Post-operative outcomes and monitoring

The audit indicated differing frequencies in post-operative monitoring and outcome assessment related to ACL injuries (Figure 5). In terms of radiological monitoring for growth disturbances, 59% (n = 16/27) of centres had established monitoring protocols, whereas 41% (n = 11/27) did not carry out systematic radiological monitoring.

Functional outcome scores were recorded post-operatively in 30% (n = 8/27) of centres, while 71% (n = 19/27) did not maintain regular records of functional scores following the operation.

According to the BOAST guideline recommendations, post-operative complications will be tracked using two key metrics: re-rupture and contralateral rupture rates. Of the centres studied, re-rupture rates were recorded by 48% (n = 13/27) of centres, while contralateral rupture rates were monitored by 30% (n = 8/27).

4. Discussion

The surgical management of ACL ruptures in skeletally immature patients is a rapidly growing area of orthopaedic practice [1]. Greater access to MRI and recognition of the risks of secondary meniscal injury following conservative management of the injury have contributed to this trend [6]. Increased awareness of the vulnerability of paediatric athletes and particular patient subgroups, such as female adolescent athletes, to ACL injury has led to a call for improved evidence-based

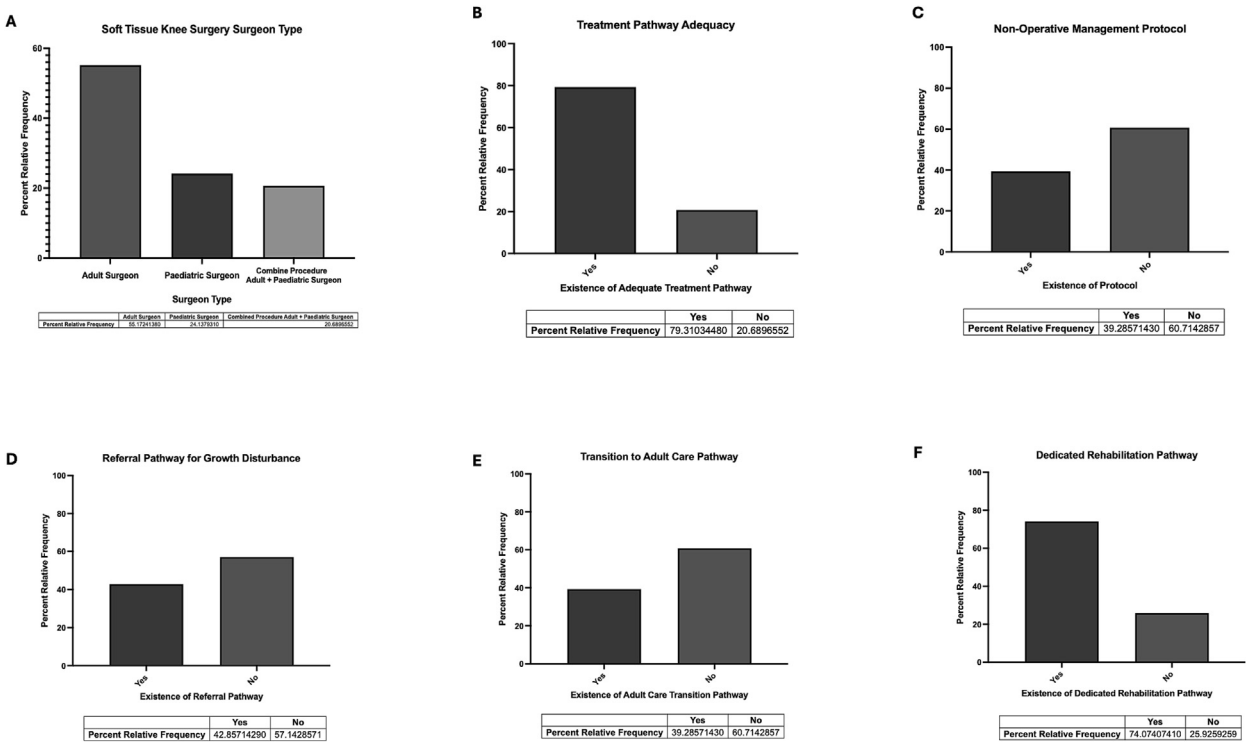


Figure 4. Treatment pathways and surgical provision for paediatric knee injuries across UK centres. Bar graphs showing (A) type of surgeon performing paediatric soft tissue knee surgery, (B) presence of adequate treatment pathway, (C) availability of non-operative management protocol, (D) established referral pathway for growth disturbance, (E) existence of transition to adult care pathway, and (F) existence of dedicated rehabilitation pathway. Data are presented as the percentage of responding centres.

prevention, diagnosis, and management internationally [7,8]. Long-term consequences of ACL rupture include post-traumatic osteoarthritis (PTOA), the rates of which have shown only a modest decline over the past forty years [9].

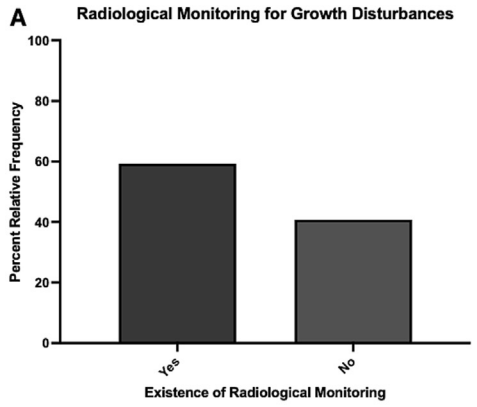
In 2022, the BOAST guidelines provided recommendations for the diagnostic and treatment pathways of ACL ruptures in skeletally immature patients, addressing three phases of patient care: Assessment and Diagnosis, Management, and Post-operative Care. This guideline was produced following an in-depth review of UK practices and treatment evidence concerning children with ACL and meniscal injuries initiated by both BSCOS and BASK. This was due to the high variability in treatment across the UK, combined with regional differences in service provision and barriers to care for these injuries. The consistent delivery of care through optimised treatment pathways, accompanied by accurate recording of outcome data, allows for equality of treatment and aids resource provision.

The PANA study is the first multi-centre audit of these guidelines within the United Kingdom. The results show that national variability in infrastructure and practices for managing this patient group remains. This relates to multiple aspects of care, including initial diagnosis and referral to an acute knee pathway, multi-disciplinary treatment decisions and post-operative monitoring and rehabilitation. The mean wait time for undergoing an MRI and performing surgery is another notable area of variation in practice.

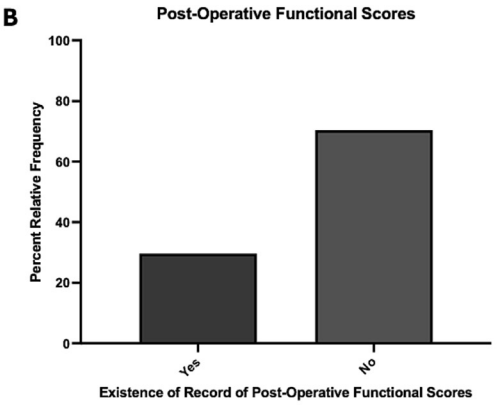
Variability in the management of common paediatric orthopaedic conditions at both the individual patient level and from a health systems perspective has been noted by the Getting it Right First Time (GIRFT) report on Paediatric Trauma and Orthopaedic Surgery [6]. Priority concerns the strengthening of regional care networks and standardising treatment pathways, as well as efficiency of care and avoiding unnecessary wait times or inpatient stays. To manage paediatric lower limb injuries, introducing acute knee pathways, which should include an MDT approach, is recommended and day-case treatment is advised where possible. Like the PANA study, the GIRFT survey demonstrates national heterogeneity in treatment pathways implemented, including the presence of multidisciplinary frameworks and whether performing surgeons are primarily adult or paediatric knee surgeons.

Previous multi-centre evaluations performed in Europe and North America have demonstrated variability regarding perceptions of the best management options for paediatric ACL ruptures [10,11]. While these have typically focused on the surgical approach, they serve as additional evidence of the ongoing need to standardise practice or gather high-quality evidence for making individualised treatment decisions.

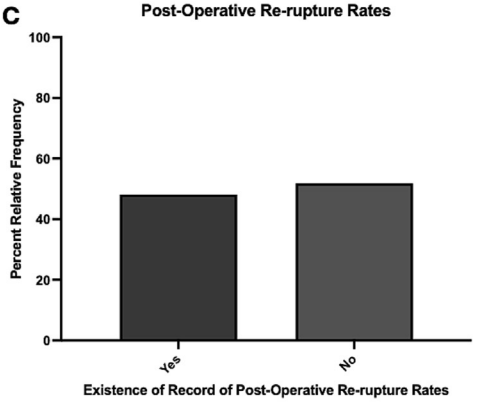
The GIRFT report highlighted inconsistencies in the clinical coding of injuries and procedures performed for paediatric orthopaedic conditions. Accurate and consistent coding has been emphasised as a key priority for improving care delivery.



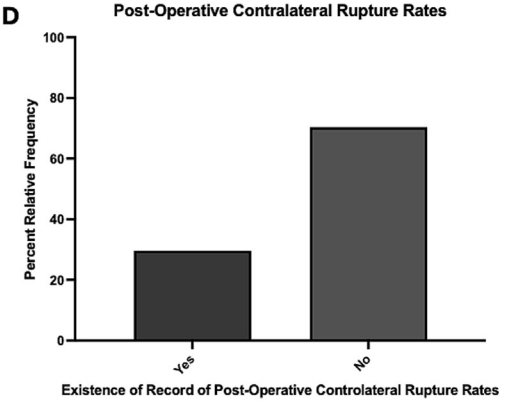
	Yes	No
Percent Relative Frequency	59.25925930	40.7407407



	Yes	No
Percent Relative Frequency	29.62962960	70.3703704



	Yes	No
Percent Relative Frequency	48.14814810	51.8518519



	Yes	No
Percent Relative Frequency	29.62962960	70.3703704

Figure 5. Post-operative monitoring practices across UK centres. Bar graphs demonstrating (A) implementation of radiological monitoring for growth disturbances, (B) recording of post-operative functional scores, (C) documentation of post-operative re-rupture rates, and (D) monitoring of post-operative contralateral rupture rates. Data was presented as a percentage relative to the frequency of responding centres.

Achieving standardisation of care will require the precise collection of data regarding diagnosis, treatments, and outcomes on a large scale. Introducing mandatory reporting through a national registry will likely play a crucial role. The National Joint Registry is an example of the utility of registries in obtaining highly powered data that can inform management decisions [12]. The National Ligament Registry (NLR) exists to improve management for patients undergoing knee ligament reconstruction [13]. The GIRFT Report has recommended the introduction of mandatory documentation of paediatric patient data in the NLR as part of a satisfactory acute knee pathway, as currently, this does not allow for knee ligament reconstruction [13]. The GIRFT Report has recommended the introduction of mandatory documentation of paediatric patient data in the NLR as part of a satisfactory acute knee pathway, as currently, this does not allow for those aged under 16 years.

The recognition of the need for ACL registries is reflected in their emergence internationally in recent years [14,15]. Sweden and New Zealand have well-established national ACL registries, aiming to achieve the common goal of ensuring that every ACL injury is registered [16,17]. While the demographics of patients sustaining ACL rupture remain relatively consistent in different areas, treatment practices, including graft choice, vary [14]. The value of an ACL registry within the UK would be to determine how various treatments affect both short- and long-term outcomes. This may include post-operative complications and ACL re-rupture rates in the shorter term. The use of PROMs data for paediatric patients needs to be improved and will be important both in the immediate post-injury period and during longer-term follow-up [6]. PTOA is the most well-recognised contributor to longer-term morbidity following ACL rupture. The occurrence of the injury at a young age makes paediatric patients particularly vulnerable to the development of PTOA. It remains unclear whether

surgical management options or even conservative management can reduce the risk of PTOA. The availability of comprehensive registry data, which includes follow-up into adulthood, is necessary to answer this question. Accurate reporting on re-rupture rates within registry data is particularly crucial for evaluating treatment efficacy. For ACL repair techniques specifically, the ACL STARR study provides valuable insights into outcomes that should inform future registry data collection and analysis [18].

Our study highlights the importance of increasing the number of locally agreed-upon protocols for non-operative management. This would improve and unify high-quality care in managing non-operative cases. This data highlights significant variability in post-operative monitoring practices across UK centres managing paediatric ACL injuries. Gaps in systematic outcome tracking, post-operative complication tracking, and growth monitoring protocols require further attention. The lack of consistent practices in recording functional scores, re-rupture rates, and contralateral rupture rates across the centres studied indicates a need to reinforce BOAST guidelines, which may extend to centres across the entirety of the UK.

The phase of return to sport is often underaddressed outside of a professional sporting environment. More precise guidelines on sport-specific rehabilitation need to be incorporated into existing public sector physiotherapy. This represents a significant gap in the current management pathway that requires attention to optimise long-term outcomes and reduce re-injury rates in paediatric patients.

Widespread implementation of the BOAST guidelines within the UK, along with consistent reporting of outcomes, would facilitate standardisation of care for children and adolescents sustaining ACL injuries. The PANA study provides an initial benchmark for national practice, necessitating re-auditing following the dissemination of the study findings. As a key priority, the authors recommend that more knee MDTs be established as part of the acute knee pathways to initiate optimal management of paediatric ACL injury. Such an MDT would likely consist of orthopaedic surgeons, specialist nurses, child psychologists and paediatric physiotherapists with specialist training in ACL injury.

5. Limitations

There were limitations to this audit. In the first instance, only 22 hospitals were included, whereas there are approximately 150 acute trusts across England and Wales [19]. Whilst not all may offer specialist paediatric services at the point of surgery, it must be acknowledged that children will present acutely to Emergency Departments in these settings. As the guidelines refer to the initial assessment, imaging, and management of these patients, future audits would hopefully capture a larger proportion of these acute trusts to gain a more representative sample of the state of care across the UK. Data was collected via a self-reported questionnaire. This may not accurately represent actual clinical practice and may be subject to recall bias. Moreover, some responses varied across trusts, indicating that there might not be a single unified pathway in some hospital trusts. This audit measured service provision and adherence to guidelines rather than specific clinical outcomes, and did not correlate guideline adherence with patient clinical outcomes or complication rates. Finally, since the publication of the BOAST guidelines in 2022, some centres may have been in the process of initiating change at the time of data collection, which may have accounted for some of the variability in practice.

6. Conclusion

Following the release of the BOAST guidelines in 2022, this multi-centre audit has revealed discrepancies in practices across the UK. A multidisciplinary approach is essential for enhancing patient care and improving outcomes in this population by establishing a safe care framework and promoting best practices.

Ethics statement

The Paediatric National Anterior Cruciate Ligament Audit (PANA) was a multicentre study, registered at the host institution, Cambridge University Hospital, with QSIS number 5988, and approved by the Caldicott Guardian at CUH, Dr Sani Aliyu. It contained no patient-identifiable data and was a service evaluation of standards. It therefore did not require formal approval from the ethics board. Audit leads locally were responsible for registering the audit at their institution and had to confirm this before registering.

The lead auditor was Stephen McDonnell, Associate Professor, Consultant Surgeon, Division of Trauma and Orthopaedics.

CRediT authorship contribution statement

Benjamin D. Gompels: Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Alagu Subramanian:** Writing – review & editing, Writing – original draft, Visualization, Investigation, Formal analysis, Data curation. **Ilias E. Epanomeritakis:** Writing – original draft, Formal analysis, Data curation. **Daniel Hide:** Writing – original draft, Formal analysis. **Michael Daniel Collins:** Writing – original draft, Formal analysis. **Thomas Molloy:** Writing – original draft, Formal analysis. **Florence Bradshaw:** Writing – original draft, Formal analysis. **Simone Castagno:** Writing – original draft, Formal analysis. **Ignatius Liew:** Writing – review & editing, Formal analysis. **William Nabulyato:** Writing – original draft, Formal analysis. **Chinmay Gupte:** Writing – review & editing, Validation, Supervision. **Nicolas Nicolaou:**

Writing – review & editing, Validation, Supervision. **Stephen M. McDonnell:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Conceptualization. **Alexandra Macmillan:** . **Pranai Buddhdev:** . **Michael Wilson:** . **Ben Marson:** . **Dev Hitesh Thakker:** . **Nathanael Ahearn:** . **Rakan Kabariti:** . **Alexander Glover:** . **Emily London:** . **Caroline Hing:** . **Mahak Baid:** . **Roshana Mehdian:** . **Dimitrios Manoukian:** . **Ran Wei:** . **Nima Razii:** . **Innes D.M. Smith:** . **Wai Huang Teng:** . **Tim Lindsay:** . **Lysander James Gourbault:** . **Robert Whitham:** . **Chryssa Neo:** . **Simon John Federer:** .

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Nicolas Nicolaou reports a relationship with Smith and Nephew that includes: speaking and lecture fees. Nicolas Nicolaou reports a relationship with British Orthopaedic Sports Trauma and Arthroscopy Association that includes:. Nicolas Nicolaou reports a relationship with British Society for Children's Orthopaedics that includes: board membership. Nicolas Nicolaou reports a relationship with Arthrex Inc that includes: speaking and lecture fees. Nicolas Nicolaou reports a relationship with British Patellofemoral Society that includes: board membership. Given his role as invited guest editor, had no involvement in the peer review of this article and had no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to another journal editor. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. PANA Collaborative Group Author List

- Ms Alexandra Macmillan, Cambridge University Hospitals, NA
- Mr Pranai Buddhdev, Mid & South Essex NHS Trust
- Michael Wilson, University Hospitals Dorset
- Mr Ben Marson, Birmingham Children's Hospital
- Mr Dev Hitesh Thakker, Royal Surrey NHS Foundation Trust
- Mr Nathanael Ahearn, Torbay and South Devon NHS Foundation Trust
- Mr Rakan Kabariti, Robert Jones and Agnes Hunt Orthopaedic NHS Foundation Trust
- Mr Alexander Glover, Robert Jones & Agnes Hunt Orthopaedic NHS Foundation Trust
- Miss Emily London, Royal Free Hospital
- Professor Caroline Hing, St George's Hospital
- Mr Mahak Baid, Aneurin Bevan University Health Board
- Ms Roshana Mehdian, St George's, Epsom and St Helier Hospital Group
- Dimitrios Manoukian, Barts Health NHS Trust/Royal London Hospital
- Mr Ran Wei, Kingston & Richmond NHS Foundation Trust
- Mr Nima Razii, NHS Greater Glasgow and Clyde
- Mr Innes D M Smith, NHS Greater Glasgow and Clyde
- Mr Wai Huang Teng, Lewisham and Greenwich NHS Trust
- Dr Tim Lindsay, Chelsea and Westminster Hospital NHS Foundation Trust
- Mr Lysander James Gourbault, Gloucester Hospitals NHS Trust
- Mr Robert Whitham, Somerset NHS Foundation Trust
- Ms Chryssa Neo, Edinburgh Orthopaedics
- Mr Simon John Federer, University Hospitals Sussex NHS Foundation Trust

Appendix 1. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.knee.2026.104390.

References

[1] Nogaro M-C, Abram SGF, Alvand A, Bottomley N, Jackson WFM, Price A. Paediatric and adolescent anterior cruciate ligament reconstruction surgery: results from a national cohort of 16,000 patients over 20 years. Bone Jt J 2020;102-B:239–45. doi: https://doi.org/10.1302/0301-620X.102B2.BJJ-2019-0420.R2.
[2] LaBella CR, Hennrikus W, Hewett TE, COUNCIL ON SPORTS MEDICINE AND FITNESS and SOO, Brenner JS, Brookes MA, et al. Anterior cruciate ligament injuries: diagnosis, treatment, and prevention. Pediatrics 2014;133:e1437–50. doi: https://doi.org/10.1542/peds.2014-0623.
[3] DeFrancesco CJ, Storey EP, Shea KG, Kocher MS, Ganley TJ. Challenges in the management of anterior cruciate ligament ruptures in skeletally immature patients. JAAOS - J Am Acad Orthop Surg 2018;26:e50.
[4] Dabis J, Yasen SK, Foster AJ, Pace JL, Wilson AJ. Paediatric proximal ACL tears managed with direct ACL repair is safe, effective and has excellent short-term outcomes. Knee Surg Sports Traumatol Arthrosc 2020;28:2551–6. doi: https://doi.org/10.1007/s00167-020-05872-2.
[5] BOA. BOAST - Management of Anterior Cruciate Ligament Injury in the Skeletally Immature Patient n.d. https://www.boa.ac.uk/resource/boast-management-of-anterior-cruciate-ligament-injury-in-the-skeletally-immature-patient.html. [Accessed 5 January 2025].
[6] Hunter J. GIRFT National Specialty Report on Paediatric Trauma and Orthopaedic Surgery. NHS Getting It Right First Time; 2022.

[7] Ardern CL, Ekås GR, Grindem H, Moksnes H, Anderson AF, Chotel F, et al. 2018 International Olympic Committee consensus statement on prevention, diagnosis and management of paediatric anterior cruciate ligament (ACL) injuries. Br J Sports Med 2018;52:422–38. doi: https://doi.org/10.1136/bjsports-2018-099060.
[8] Childers J, Eng E, Lack B, Lin S, Knapik DM, Kaplan DJ, et al. Reported anterior cruciate ligament injury incidence in adolescent athletes is greatest in female soccer players and athletes participating in club sports: a systematic review and meta-analysis. Arthroscopy 2024. doi: https://doi.org/10.1016/j.arthro.2024.03.050.
[9] Liukkonen R, Vaajala M, Mattila VM, Reito A. Prevalence of post-traumatic osteoarthritis after anterior cruciate ligament injury remains high despite advances in surgical techniques: a systematic review and meta-regression analysis. Bone Jt J 2023;105-B:1140–8. doi: https://doi.org/10.1302/0301-620X.105B11.BJJ-2023-0058.R1.
[10] Accadbled F, Gracia G, Laumonerie P, Thevenin-Lemoine C, Heyworth BE, Kocher MS. Paediatric anterior cruciate ligament tears: Management and growth disturbances. a survey of EPOS and POSNA membership. J Children's Orthop 2019;13:522–8. doi: https://doi.org/10.1302/1863-2548.13.190074.
[11] Gracia G, Thévenin-Lemoine C, Laumonerie P, Sales de Gauzy J, Accadbled F. Anterior cruciate ligament tears in children: Management and growth disturbances. a survey of French Arthroscopy Society members. Orthop Traumatol Surg Res 2019;105:747–50. doi: https://doi.org/10.1016/j.otsr.2019.02.017.
[12] Ben-Shlomo Y, Blom A, Boulton C, Brittain R, Clark E, Dawson-Bowling S, et al. The National Joint Registry 19th Annual Report 2022. London: National Joint Registry; 2022.
[13] National Ligament Registry UK | Knee Surgeons UK | NLR | ACL Surgeons n.d. https://www.uknlr.co.uk/. [Accessed 21 January 2025].
[14] Prentice HA, Lind M, Mouton C, Persson A, Magnusson H, Gabr A, et al. Patient demographic and surgical characteristics in anterior cruciate ligament reconstruction: a description of registries from six countries. Br J Sports Med 2018;52:716–22. doi: https://doi.org/10.1136/bjsports-2017-098674.
[15] Mouton C, Moksnes H, Janssen R, Fink C, Zaffagnini S, Monllau JC, et al. Preliminary experience of an international orthopaedic registry: the ESSKA Paediatric Anterior Cruciate Ligament Initiative (PAMI) registry. J Exp Orthop 2021;8:45. doi: https://doi.org/10.1186/s40634-021-00366-7.
[16] Dolk DC, Hedevik H, Stigson H, Wretenberg P, Kvist J, Stålman A. Nationwide incidence of anterior cruciate ligament reconstruction in higher-level athletes in Sweden: a cohort study from the Swedish National Knee Ligament Registry linked to six sports organisations. Br J Sports Med 2024. doi: https://doi.org/10.1136/bjsports-2024-108343.
[17] Tiplady A, Love H, Young SW, Frampton CM. Comparative study of ACL reconstruction with hamstring versus patellar tendon graft in young women: a cohort study from the New Zealand ACL Registry. Am J Sports Med 2023;51:627–33. doi: https://doi.org/10.1177/03635465221146299.
[18] ACL STARR - Anterior Cruciate Ligament Stratified Accelerated Repair or Reconstruction Single blind randomised control trial for patients with proximal ACL injuries treatment with ACL repair v ACL reconstruction. - NIHR Funding and Awards n.d. https://www.fundingawards.nihr.ac.uk/award/NIHR157938. [Accessed 10 April 2025].
[19] Sidhu M, Pollard J, Sussex J. Vertical integration of primary care practices with acute hospitals in England and Wales: why, how and so what? Findings from a qualitative, rapid evaluation. BMJ Open 2022;12:e053222. doi: https://doi.org/10.1136/bmjopen-2021-053222.