Research priorities of members of the British Association for Surgery of the Knee: a modified Delphi consensus

Abstract

Aims

This study aims to identify the top unanswered research priorities in the field of knee surgery using consensus-based methodology.

Methods

Initial research questions were generated using an online survey sent to all 680 members of the British Association for Surgery of the Knee (BASK). Duplicates were removed and a longlist was generated from this scoping exercise by a panel of 13 experts from across the UK who provided oversight of the process. A modified Delphi process was used to refine the questions and determine a final list. To rank the final list of questions, each question was scored between one (low importance) and ten (high importance) in order to produce the final list.

Results

This consensus exercise took place between December 2020 and April 2022. A total of 286 clinicians from the BASK membership provided input for the initial scoping exercise which generated a list of 105 distinct research questions. Following review and prioritisation, a long list of 51 questions was sent out for two rounds of the Delphi process. Forty-two clinicians responded to the first round and 24 responded to the second round. A final list of 24 research questions was then ranked by 36 clinicians. The topics included arthroplasty, infection, meniscus, osteotomy, patellofemoral, cartilage and ligament pathologies. The management of early osteoarthritis was the highest-ranking question.

Conclusion

A Delphi exercise involving the BASK membership has identified the future research priorities in knee surgery. This list of questions will allow clinicians, researchers and funders to collaborate in order to deliver high quality research in knee surgery and further advance the care provided to patients with knee pathology.

Clinical significance of this research

- **This study identifies the current unanswered research priorities in the field of knee surgery. This study will form the foundation for future research applications which will lead to high quality research studies in order to address the evidence gaps. This in turn will advance the care provided to patients with knee pathologies.**

Introduction

The last decade has seen several high impact knee studies which have had an influence on the clinical practice delivered both nationally and internationally.[1-6] The number of randomised controlled trials (RCTs), high quality prospective observational studies and large collaborative studies is increasing. There has been an exponential increase in the amount of knee research publications produced per year.[7, 8]

Orthopaedic research has traditionally been underfunded relative to other specialities, despite the very large numbers of people who undergo orthopaedic surgery every year.[9-11] One of the challenges faced by surgeons, researchers and funders who wish to deliver high-impact research is understanding the top priorities to focus on.[12, 13] To obtain funding, a high priority, well designed research question is crucial. It is important to design questions which are relevant to current practice, will have the greatest benefit for patients and have the support of clinicians who will ultimately implement the findings.

The British Association for Surgery of the Knee (BASK), with a membership of 680 individuals between 2020 and 2022, brings together a large body of clinicians across the country with the aim of improving the care of patients with knee problems. One of the aims of BASK is to promote high quality research within knee surgery in order to deliver evidence-based care for patients with knee pathology.

The BASK research committee aimed to determine the current most important research questions in knee surgery according to the members of BASK and deliver a list of high priority research questions in order to direct efforts to gain future funding and deliver high impact research studies in this area. Similar work has been carried out by the British Society for Children's Orthopaedic Surgery (BSCOS), Orthopaedic Research Collaboration in Africa (ORCA).[14, 15] The James Lind Alliance (JLA) has also worked with patient partners to produce priority lists for the problematic knee and first-time soft tissue knee injuries.[16, 17]

This study aimed to identify the unanswered research priorities in the field of knee surgery by carrying a consensus study involving BASK members.

Methods

Design

This study generated potential research questions in a survey of BASK members, used expert consensus to refine these into a manageable list for prioritisation, and then used the RAND/ UCLA appropriateness method within a modified Delphi process in order to obtain consensus on the final list, with a final scoring step to rank the questions in order.[18, 19]

An expert panel was created from the BASK research committee, with members chosen to ensure broad representation across geography and research background (such as trials, epidemiology, basic science and outcome measurement). This panel of 13 members included three females and ten male members, 12 were consultant surgeons with one physiotherapist and professor of musculoskeletal and surgical sciences. These members were based all over the country and had subspecialty interests ranging from knee revisions, osteotomy, cartilage, trauma, meniscal transplantation and ligament reconstruction. This group provided oversight of the process, helped review and facilitate the surveys used and were involved in the long-listing process to manage the large number of responses that were received. The surveys and Delphi process were open to all BASK members to participate in and the survey was advertised at the BASK annual meeting and via email to ensure all who wanted to contribute to the process were able to. Four rounds of surveys were used to ensure the appropriateness and importance of the research questions was chosen fairly and was representative of the wider views of the knee surgical community. The following stages were carried out in order to achieve consensus based on the RAND/UCLA process and previous consensus research in orthopaedics.[14, 20]

Stage 1a: Scoping survey to produce important research questions

An online survey was produced using the Survey Monkey application (San Mateo, California, USA), asking the following question 'Thinking about your clinical practice in the field of knee surgery or knee pathology, what are the most important clinical research questions that need addressing?'. Responders were encouraged to frame their question using the PICO framework (Participant, Intervention, Comparator, Outcome). This survey was distributed to all 680 members of BASK via email. Two reminders were sent out and the survey remained open for 4 weeks. Responders could submit an unlimited number of responses. Data collected included grade of clinician (consultant/trainee/ academic or physiotherapist), region of work and research questions. Respondents were also asked if they would like to take part in the Delphi component of the study.

Stage 1b: Refinement of research questions

Based on responses to the stage 1a survey, a list of research questions was compiled and grouped according to topic area: infection; primary total knee replacement (TKR), TKR patellar resurfacing, robotic TKR, revision TKR, anterior cruciate ligament, meniscus, other ligaments, cartilage regeneration, osteotomy, patellofemoral and other. These questions were presented to the BASK research committee. The questions were independently reviewed by the panel members to group similar questions together, to ensure comments were presented as formal research questions, and to identify questions where research was already underway, completed, or had already been answered in the literature.

As there were too many responses for each question to be tested in a Delphi process, a long-listing process was undertaken by the research committee to remove lower-priority questions. Each of the questions were ranked between one (low priority) and five (high priority). The research committee ranked the questions based on their expert knowledge of their area of interest. Questions were deemed low priority if they would not advance the field of knee surgery, unlikely to receive significant funding or would provide difficult to answer with a quantitative clinical trial. Questions which already had high quality evidence providing an answer, a well-designed trial (with appropriate funding and peer review) underway in order to provide an answer were excluded. Questions with a mean score of three or greater were selected for the Delphi process. The senior author (AM) chaired the longlisting process in order to prevent any issues regarding a dominant voice in discussions and ensure the questions were handled with equity.

Stage 2a: Modified Delphi round 1 – Ranking of research questions

All people who had responded to the survey to indicate that they wished to take part in the modified Delphi prioritisation process were included in the following stages. A further email was sent to all members of BASK inviting them to take part in the modified Delphi process. A survey was created using SurveyMonkey (San Mateo, California, USA) and sent via email members that indicated they wished to take part in the process in both stage 1 and the second invitation email. Those that responded to stage 2a were defined as the Delphi group for the study. Delphi group members were asked to review each question produced in stage 1 and rank them from one to nine. A score of one indicated the lowest appropriateness and a score of nine indicated the highest appropriateness, based on the importance of each question to clinical practice. The survey was open for four weeks

with a reminder sent at two and three weeks. There was also the opportunity to submit further questions and refine the existing questions.

The BASK research committee reviewed all suggestions and incorporated these changes if they judged them beneficial in improving the research question.

For each question, the median score was taken. Following the RAND/UCLA process, questions with a median score of seven or higher were categorised as accepted and passed to stage 3. Questions with a median score of five or lower were eliminated at this stage. Questions with a median score above five but below seven were categorised as undecided and went through to a stage 2b.

Stage 2b: Delphi round 2 – second voting stage.

A new survey produced using SurveyMonkey (San Mateo, California, USA) was created including questions with a median score of greater than five and less than seven and any new questions identified in Stage 2a. This survey was sent to all those that were part of the Delphi group. They were presented with the results of stage 2a and provided with a list of questions which were deemed appropriate. They were then asked to score the questions between one and nine in terms of appropriateness. A score of one indicated the lowest appropriateness and a score of nine indicated the highest appropriateness, based on the importance of each question to clinical practice. The survey was open for four weeks with a reminder sent at two and three weeks.

Questions which had a median score of seven or higher were selected for stage 3. The remaining questions were excluded at this stage.

Stage 3: Delphi round 3- final ranking of questions

A final survey created using SurveyMonkey (San Mateo, California, USA) was sent via email to all those that were part of the Delphi group, as part of a process for ranking the final list. This survey included all questions which had a median score of seven or greater in stage 2a and 2b, comprising the accepted but unranked list. Responders were asked to review the questions and score them between one and 10. A score of one indicated low importance to the field of knee surgery and a score of 10 indicated high importance to the field of knee surgery.

The survey was open for six weeks with a reminder sent every two weeks. The mean score was taken for each question and the questions were ranked in order of importance according to mean score.

This produced a final list of the highest priority research questions in the field of knee surgery as determined by members of BASK.

Ethics

Ethical approval was not sought as this research did not directly involve patients and there was a low risk to panel participants. The participation in the voting rounds was entirely voluntary with no obligation to take part in this work. Patients and public members were not directly involved in this study.

Results

Figure 1 is a flow chart summarising the Delphi process including the number of participants at each stage and the number of questions generated.

Stage 1: Scoping and refinement of research questions

In response to the initial survey the authors received 286 responses from the BASK membership. The demographics of the respondents to the initial scoping survey can be seen in Table 1. From these 286 responses (42.1% of total membership), 239 research suggestions were made across the following topics: Infection; primary total knee replacement (TKR), TKR patellar resurfacing, robotic TKR, revision TKR, anterior cruciate ligament, meniscus, other ligaments, cartilage regeneration, osteotomy, patellofemoral and other. 77 (11.3% of total membership) of the respondents indicated they would like to take part in the formal Delphi process.

The BASK research committee then reviewed the suggestions and produced a list of 105 research questions (see ***appendix 1***). The research committee reviewed the lists of 105 questions and firstly identified which questions which already had published level 1 evidence providing an answer, a well-designed trial with a major funding award underway in order to provide an answer or questions which would be difficult to answer with a quantitative clinical trial were excluded (n=22, can be seen in ***appendix 1***). The research committee then ranked each question based on appropriateness. 51 questions had a mean score of 3 or greater and these questions were put forward for the Delphi process (appendix 2 provides a list of these 51 questions).

Stage 2a: Modified Delphi round 1 – Ranking of research questions

Forty-two (42/77, 54.5%) people took part in stage 2a of the modified Delphi. Thirteen questions had a median score of 7 or greater, 29 questions received a score of between 5.1 and 6.9 and were entered into stage 2b and nine questions received a score of less than five and were eliminated at this stage. A summary of stage 2a and the list of questions can be seen in appendix 3.

Stage 2b: Stage 2b: Delphi round 2 – second voting stage.

Twenty-four (24/77 31.2%) responses were received for stage 2b process, 15 questions at this stage had a median score of greater than or equal to seven and were added to the final list. The 28 questions which received a median score of seven or greater in either round were further reviewed

by the research committee to ensure their wording was optimised. Questions which were too similar or overlapped were combined to ensure a final list of distinct questions. **Appendix 4** provides an overview of the results from stage 2b of the Delphi process highlighting questions which were proceeded to stage 3, if any questions were combined and the reason for this and the questions which were eliminated. Following stage 2 a final list of 24 questions were put forward to stage 3 for final ranking.

Stage 3: Delphi round 3- final ranking of questions

Thirty-six members (36/77, 46.8%) ranked each of the 24 questions according to importance to the field of knee surgery. This produced a ranked list of the most important 24 questions in knee surgery. The final list can be seen below in ***table 2***.

Discussion

This priority setting exercise established the top research priorities for knee surgery which have not previously been addressed, from the perspective of the UK knee surgeon community. The questions were generated by the BASK membership, a large sub-speciality groups in the orthopaedic community and the major UK body representing knee surgeons. The top 24 research priorities included questions related to painful knee arthroplasty, dissatisfaction following TKR, injection therapy, meniscus, prosthetic joint infection, ligament injury, cartilage and patellofemoral. The priorities identified in this exercise were similar to those identified in previous JLA exercises. The JLA has produced a top 10 research priorities list for early hip and knee osteoarthritis, problematic knee arthroplasty and first-time soft tissue knee injuries.[16, 17, 21] There were several similarities between the research priorities identified in this study and the JLA exercises. Some examples of the areas of agreement include diagnosis and management of prosthetic joint infection, the management of chronic pain post TKR, causes of patient dissatisfaction post TKR, the best treatment for early OA, effective non-surgical treatment for OA and the management of ACL injuries in young patients. The agreement between this exercise and JLA implies that the research priorities of BASK surgeons is in-line with that of the JLA. This strengthens the belief that this comprehensive list includes the top research priorities for knee surgery.

Through formalising the prioritisation process, using a transparent and structured methodology, we aimed to provide research priorities that were both high impact and meaningful and to ensure that priorities were not biased by individual or institutional preferences. This list of research questions is open to all researchers and clinicians interested in knee surgery. It is hoped that an understanding of the priorities for research in knee surgery will inform funding bodies to prioritise the highest value research and commission important topics. Through publication of this list of research priority areas, the authors hope to provide clarity for all researchers and clinicians about the most important research questions in the field of knee surgery.

The strengths of this work relate to both the methodology used and the participants involved. This consensus exercise was performed using a survey of a large and representative body of the knee surgical community, refined by a modified Delphi process. The Delphi process is a formalised way of efficiently achieving consensus between participants.[19, 20] The process has been used previously in orthopaedic research in order to identify research priorities.[13-15] Given the very large number of responses received, a modified Delphi was used for this process to ensure that the surveys were manageable and responses were meaningful. By using the BASK research committee, a group of

subspecialist experts with diverse research interests and geography, to guide the process and review responses, the process was subject to regular oversight and questions were worded carefully to ensure they were answerable by research.[22] The research committee also identified questions which already had published level 1 evidence providing an answer, a well-designed trial with a major funding award underway in order to provide an answer, to ensure the remaining questions were up to date and useful to those planning or funding research in the field. The entire BASK membership was provided the opportunity to offer suggestions for research questions and take part in the consensus exercise, ensuring that the questions and views identified in this process were representative of the wider body of knee surgeons in the UK as confirmed by the data on grade and region presented in table 1.

A limitation of this work is that by performing a consensus exercise solely amongst BASK members, clinicians and researchers who are not part of BASK did not have the opportunity to contribute to the research priorities identified. Secondly, although BASK includes some physiotherapists, only one physiotherapist took part in this exercise. The authors did not involve a formal physiotherapy body as part of the consensus exercise as that would cover a much wider part of clinical practice which only partly aligns with the conditions seen and treated by knee surgeons. Physiotherapy is an effective treatment for many knee pathologies [23, 24] and a proportion of the questions involved focussed on the non-operative treatment of conditions, suggesting that surgeons did not prioritise issues around operative care but were more focused on the best treatment of the patients they see. Similarly, patients were not involved in this consensus exercise. Patient members have been used in other consensus or research priority setting partnerships in knee surgery such as James Lind Alliance (JLA) Priority Setting Partnerships.[17, 25] Patients were not involved in this exercise as the authors wanted to address the evidence gaps in current practice in knee surgery, and it was felt a working understanding across knee surgery was required, whereas it would be difficult to establish a patient body with broad experience across the full range of knee surgery.

A further limitation of this work is the reduction in participants across each stage of the process. Thirty-six participants responded to the final ranking exercise leading to potential bias of the results in favour of a particular area of knee surgery. This is to be expected as a Delphi process covering 51 proposed questions is a significant time commitment, and we are very grateful for the participation of those who gave their time to this work. This bias was reduced by providing the entire BASK membership with the final list of research priorities and an opportunity to suggest any changes should they wish. The research committee, which comprised of experts throughout the entire field of knee surgery, reviewed and agreed with the priorities list again minimising the impact of potential bias. Finally, as described above there was overlap between the priorities list produced in this

exercise and that produced by the JLA for both arthroplasty and soft tissue suggesting the impact of bias was minimised.[16, 17, 21]

A limitation of this work is that data was not collected on race and general background of the respondents. This could imply that the responses were not representative of the views of the multicultural background of surgeons and varied backgrounds of patients. However, the survey and responses were sent out to the entire BASK membership and a large geographical spread of responses was received. In addition, the priorities presented are applicable and important to patients across the full range of races, levels of deprivation and genders. The delivery of this research needs to be managed carefully and intentionally to ensure we deliver research of importance to the whole population, without excluding key groups.[26, 27]

Conclusion

This work provides a framework for clinicians, researchers and funders to collaborate and delivery high quality research to answer the future research priorities in knee surgery. This will ensure evidence-based care can be delivered to the most important issues faced by patients, greatly improving the care provided to patients in the future.

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Demographic		Number
Grade	Consultant	238
	Registrar/ Trainee	39
	Scientist/ Academic	3
	Physiotherapist	1
	Other	5
Region	East Midlands	15
	Kent, Surrey, Sussex	18
	London	30
	Scotland	18
	West Midlands	35
	North Western	31
	Northern	10
	Northern Ireland	4
	Oxford	19
	Severn	21
	South West Peninsula	13
	Wales	9
	Wessex	12
	Yorkshire and Humber	17
	East of England	25
	Outside UK	9

Table 1: A table demonstrating the demographics of the respondents to the Stage 1a, the scoping exercise to produce an initial list of questions. The table demonstrates the geographical rotation and clinical grade of respondents.

Research question	Ranking

1. What is the best treatment for early knee OA including surgical and non-surgical strategies?	7.20
2. What factors can we modify before or at the time of knee replacement to reduce the chances of patients having ongoing pain or functional limitation?	7.14
3. What are the causes of patient dissatisfaction after TKR?	6.86
4. How can onset or progression of arthritis be prevented in those with soft tissue knee injuries (such as ligamentous, meniscal or articular cartilage injury)?	6.82
5. What is the effectiveness of injection therapy for knee osteoarthritis?	6.77
6. In patient with obesity what is the best method of optimising their pre-operative health status and reducing weight prior to surgery?	6.49
7. Does surgery work for young people (ie under 50 or 55) with a meniscal tear who have not improved with initial conservative treatment?	6.37
8. What is the best method of diagnosing a prosthetic joint infection?	6.14
9. In which situations should an acute ACL injury be treated surgically?	6.11
10. What are the most-effective non-surgical treatments (alone or in combination) for knee osteoarthritis?	6.09
11. What is the best way managing chronic pain after previous TKR?	6.06
12. What is the most effective treatment of patellofemoral pain?	6.06
13. What is the outcome, efficacy and cost-effectiveness of different cartilage restoration procedures?	5.97
14. In the treatment of medial compartment osteoarthritis in young patients, is arthroplasty or osteotomy a better option?	5.97
15. For elderly people with periprosthetic fractures of the femur around a TKR, should we fix the fracture, or replace the distal femur?	5.74
16. Is fresh osteochondral allograft an effective treatment for osteochondral lesions of the knee?	5.69
17. How should we introduce new implants in to clinical practice and what is the minimum information we need to collect about their performance before widespread adoption and use in permitted?	5.66
18. How do we assess competence in knee surgery both for completion of training and ongoing consultant practice?	5.57
19. Should multi-ligament knee-injury be managed with early total reconstruction or staged management?	5.54
20. What is the best management for meniscal root tears?	5.54
21. Is cartilage repair effective in children?	5.51
22. What is the best management of first-time patellar dislocation (either for all patients, or stratifying by risk factors)?	5.40

23. Should lateral extra articular stabilisation be used for people over the age of 25 undergoing ACL surgery?	5.14
24. When should trochleoplasty be used for recurrent patellar instability?	5.06

Table 2: A table demonstrating the top 24 unanswered research priorities identified though this modified Delphi exercise. The table includes the mean score from Stage 3 which allowed the ranking of these questions.

Figure 1: A flow chart demonstrating the Delphi process and the number of participants at each stage