

EXAMINAT

#### CODE: CAF/21/06

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#### **RESEARCH PROJECT BRIEFING**

EDUCAT

EXPERIMENT

DATA

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Improving the clinical care pathway in those referred for hip and knee arthroplasty

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### AIMS

The primary aim of the thesis was to improve the clinical care pathway for individuals referred for hip and knee arthroplasty (joint replacement surgery) by addressing inefficiencies and applying novel methodologies, including artificial intelligence (AI). This was in response to growing concerns about prolonged waiting times and resource limitations in orthopaedic care. The overarching goal was to enhance patient experience, optimise clinical outcomes, and increase service efficiency, particularly through improved prioritisation mechanisms for surgical referral.



#### **KEY FINDINGS**

**Current and Future Challenges:** 

- Without intervention, waiting times for hip and knee arthroplasty are expected to exceed two years, with demand projected to increase by 28% by 2038.

- Delays in surgery are linked with worse patient outcomes and increased emergency department utilisation.

Al and Machine Learning Integration:

- Developed AI tools including the PATHWAY prioritisation model.
- Applied Natural Language Processing (NLP) to clinical notes and computer vision to imaging data for improved triage.
- Demonstrated feasibility of AI in supporting fair and efficient patient prioritisation.
- Patient and Public Involvement (PPI):
- Stakeholder engagement highlighted a strong preference for prioritisation tools that consider both clinical and patient-specific factors (e.g., pain levels, daily functioning).

Health Economics and Service Implications:

- Forecasts show potential annual costs could rise by £26 million if demand trends continue unchecked. - AI methods offer potential for better resource allocation and system efficiency.

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#### WHAT DID THE STUDY INVOLVE?

The study followed a mixed-methods approach:

- Data Analysis: Used Scottish Arthroplasty Project data for predictive modeling of future demand.
- Artificial Intelligence: Leveraged NLP and computer vision to automate assessment of clinical documentation and imaging.
- Health Economics: Modeled cost implications and bed-day usage projections.
- Stakeholder Engagement: Surveys and consultations with clinicians and patients informed prioritisation model development.
- Public Involvement (PPI): Public voices influenced the prioritisation framework, ensuring fairness and inclusivity were embedded in model design.



# WHAT WERE THE RESULTS AND WHAT DO THEY MEAN?

Findings:

- Predictive modeling revealed substantial expected increases in waiting times for arthroplasty procedures.
- Al-driven tools proved valuable in addressing inefficiencies in patient triage and care planning.
- A new prioritisation approach was developed, integrating both patient-specific and clinical factors.

Implications:

- Al integration can reduce waiting times, support equitable surgical access, and improve overall healthcare delivery.
- Offers a scalable model adaptable to other high-demand elective procedures.





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## WHAT IMPACT COULD THE FINDINGS HAVE?

Policy: Recommends adoption of AI-based triage tools in healthcare systems to tackle inefficiencies and inequities.

Patients: Improved prioritisation can reduce delays and improve quality of life.

Practice: Demonstrates how technology can streamline clinical decision-making, reduce administrative burden, and improve resource utilisation.



### HOW WILL THE OUTCOMES BE DISSEMINATED?

Dissemination of Outcomes:

- Planned publications in peer-reviewed journals including Bone & Joint Research and the Bone & Joint Journal.
- Presentations at clinical and academic conferences.
- Open sharing of algorithms and data analyses to promote transparency and reproducibility.
- Ongoing engagement with healthcare policymakers and professional stakeholders.



## CONCLUSION

Current healthcare systems face unsustainable pressures due to rising demand for arthroplasty. This project illustrates how AI can be a powerful tool for enhancing clinical pathways, ensuring better patient outcomes, and optimising the use of healthcare resources. Equity and efficiency should remain guiding principles in future policy and practice.



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