



Integrated care systems, research, and innovation

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Twenty-first century medical and surgical practice is firmly founded upon evidence-based medicine. Accordingly, there is an increased awareness and application of research to orthopaedic practice. Randomized controlled trials (RCTs) are commonly regarded as the benchmark for unbiased assessment of the effectiveness of our interventions, and synthesize the highest level of evidence on the pyramid of evidence-based medicine.¹

Pragmatic, multicentred RCTs with high participant volume that are appropriately powered have the ability to deliver high-quality research. Data from RCTs permit us to quantify the risk of benefit and harm following an intervention and investigate variations of each within subgroups, therefore helping us tailor treatments to individual patients.² Conversely, non-randomized studies may be vulnerable to bias or systematic error.

Despite this, even within the most highly indexed orthopaedic journals, only 10% to 20% of research articles are Level I or II studies,³ indicating that studies in every level can usefully contribute to the evidence base.

However, Level I studies are complex and currently require significant resource intensity to complete. Consequently, the finite limit of funding available for these studies restricts the number of Level I studies that can be performed. This slows the growth of our evidence base. If clinical research studies could be performed with fewer resources, this would increase the breadth and rate of development of our evidence.

The transformation in the delivery of trauma and orthopaedic services has the potential to deliver clinical research in a very resource-efficient manner. In different parts of the world, trauma and orthopaedic services are delivered in a diverse range of systems. Certain aspects of the healthcare system facilitate multicentre clinical research.

These include the routine collection of data on registries^{4–11} and linkable databases,^{12–15} the ability to standardize care in multiple centres, and the ability to integrate pre-, peri-, and postoperative care, so that patients can be followed up with little to no additional costs.

We are beginning to see a significant drive towards collective multicentre research internationally, whether through registry-based studies or collaborative study design, each country with its own unique approach, uptake, and quality. For example, the Swedish joint registries, one of the most extensive and the oldest group of national joint registries (NJR), report patient-reported outcome measures (PROMs) with near 90% completion. NJRs based in New Zealand and the UK report 70% to 80% entry, compared with the more novel American Joint Replacement Registry (AJRR) reaching only 11% of PROMs entry.¹⁶ We can also observe alternative efforts such as the American College of Surgeons' National Surgical Quality Improvement Project, which provide a validated, risk-adjusted, outcome-based multicentre database and act as a regular resource for well-powered studies in orthopaedic elective and trauma surgery.^{17–20}

Within the field of orthopaedic trauma, the Canadian Orthopaedic Trauma Society (COTS) were the first to establish a sustainable infrastructure to deliver prospective multicentre research.²¹ In their delivery of numerous RCTs over the last three decades through their experiences and successes, they provide a methodological template for collaborative large-scale research with the ability and necessity to change policy and practice to their international colleagues.^{21,22}

More recently, the NHS England Trauma Networks provide a reputable example of the opportunity that collaborative networks can provide to furthering academic research.^{23–25} The Oxford and Warwick Clinical Trials Units

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have delivered regular pragmatic, multicentre RCTs through collaboration under the NHS England Trauma Networks.^{26–30} Despite the regionalization of orthopaedic trauma services through collaborative networks within the UK nearly a decade ago, this has not yet been reciprocated in our elective care.^{31–33}

In England, Integrated Care Systems (ICSs) have been introduced and may provide a resolution to this dilemma. ICSs are new partnerships between the organizations that meet health and care needs across a geographical area, to coordinate services and to plan in a way that improves population health and reduces inequalities between different groups.³⁴ An integrated, collaborative approach, which uproots traditional barriers between clinicians of different trusts or hospitals, between surgeons and general practitioners, and between NHS and council services, is integral to the system re-design.

In many regions of the UK, the introduction of ICSs has been mirrored with the opening of dedicated Elective Orthopaedic Centres (EOCs) incorporating multiple orthopaedic units.³⁵ The amalgamation of trusts within an elective orthopaedic network offers each trust an abundant opportunity for research.^{36–38}

The introduction of orthopaedic networks offers the potential for methodological advantages with clinical services, research, and academia under one quality improvement umbrella. Networked and partnership working could create a culture of research and innovation, increasing patient accessibility to research trials and advanced orthopaedic interventions, and contributing to improvement in quality of care and outcomes.

Both secondary and tertiary orthopaedic centres will ultimately benefit from increased research accessibility and quality, and for their patients an improvement in experience, outcomes, and reduced cancellations.³⁹ Furthermore, multi-trust involvement with intercollegiate collaboration should provide opportunities for constructive reviews of study designs and identification of methodological deficits at an early stage, further strengthening research quality.

Study design, sample size, investigator profile, and quality of the publishing journal have all been demonstrated to impact study validity and in turn improve the ability to influence change in practice among orthopaedic surgeons.^{3,40} The ICSs within the UK NHS provide a unique opportunity to produce a high volume of high-quality research in a cost-effective manner that may offer a precedent for orthopaedic innovation worldwide.

Ultimately, our collective aspirations internationally should be to develop a networked clinical delivery model for orthopaedic care, delivering research in conjunction with education and high-quality patient outcomes.

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