Background

From evidence based-practice to knowledge mobilisation

This paper examines evidence-based practice from the perspective of knowledge mobilisation. Knowledge mobilisation spans interdisciplinary debates between organisational studies and clinical science on how to bridge the gaps between what scientific evidence suggests is best practice, and what occurs in frontline healthcare services (Mitton et al. 2007, Melville-Richards et al. 2019). Knowledge mobilisation extends beyond one-way knowledge transfer towards more negotiated utilisation of knowledge in power balanced collaborations (Fitzgerld & Harvey. 2015). This negotiated and collaborative process contrasts the traditional evidence-based medicine paradigm, which relies on clinical professionals as key decision-makers, using published clinical guidelines and guidance in their work.

The usefulness of guidelines as a means to translate scientific evidence into practice are often ineffective (Powell et al. 2017). The idea that knowledge will be mobilised through clinical guidance is flawed by the assumption that one type of evidence (i.e., scientific evidence) is most important from the perspective of people who provide healthcare services. Implementation research suggests that experiential knowledge, clinical training, and patient choice, amongst many other factors, are important considerations for practice (Armstrong. 2002, Spyridonidis & Calnan. 2011, South & Cattan. 2014, Grove et al. 2016). In our previous research, we identified 17 sources of knowledge and evidence which influence clinical decision making in hospitals. Scientific evidence contained in clinical guidance was

just one of these knowledge sources. We found that the prominence and significance attached to scientific evidence was flexible, context dependent and varied across hospitals we studied (Grove et al. 2018).

Practitioners and researchers generally agree on the premise of evidence-based practice, which suggests that decisions about healthcare are made using the best available, valid and relevant evidence (Sackett et al. 1996). However, there is a lack of clarity around how to find the most appropriate evidence, and how, when, and where to use it (Brownson et al. 2018). Debates remain regarding how much priority scientific evidence should be given, when compared to factors such as experiential knowledge, clinical training, and patient choice (Rycroft-Malone et al. 2004, Mazanderani et al. 2020, Smith-Merry. 2020). This study was conceptualised with a goal of improving how scientific evidence moves into practice, but we recognised that this could not be undertaken without a widespread consideration of the extensive and essential brokering of knowledge that occurs in healthcare (Grove et al. 2018).

There is a need to improve capacity for evidence-based practice among individual clinicians, professional groups and whole organisations (Kislov et al. 2014). To do this, it is important to recognise the 'pull' of knowledge into practice and factors which make different types of knowledge valuable for various types of healthcare practitioner (Davies et al. 2008). Previous research suggests that group membership and the differential authority between groups of professionals can influence how knowledge moves or is restricted within organisations (Tagliaventi & Mattarelli. 2006).

Wider environmental constraints, such as limited healthcare budgets and increasingly complex patient populations, may also restrict what can be achieved by traditional evidence-based approaches to the mobilisation of knowledge (Zardo et al. 2015). In the knowledge mobilisation literature, healthcare system reform, medical regulation and the impact of government targets have received some attention (Ferlie et al. 2012, Spendlove. 2018), yet the majority of research has focused on individual professionals and innate drivers of behaviour. For example, the importance attached to professional knowledge beliefs and tacit approaches to practice have been well described through the notion of clinical mindlines (Gabbay & Le May. 2004).

A more inclusive approach shifts focus away from evidence-based practice towards pragmatism and evidence-informed practice, where, analogous to evidence-informed policy, evidence created via scientific research is only one of many influences on practice and not always the most critical one (Sanders et al. 2017). Knowledge mobilisation recognises the range of knowledge types important in the delivery of healthcare services (Gkeredakis et al. 2011, Grove et al. 2019), and the variety frameworks available to people who "*move knowledge into action*" (Ward. 2017). Adopting this perspective encourages context to be examined, to determine the appropriate goals of service improvements and how reductions in unwarranted practice variation can be achieved (Davies et al. 2015, Grove et al. 2017).

Knowledge mobilisation in professionalised groups of orthopaedic surgeons

In the uncontrolled context of clinical practice, professional groups often cluster in profession-based tribal silos, form hierarchies and exhibit stereotypical behaviours (Braithwaite et al. 2016). In our study, orthopaedic surgeons represent the group of professionals under investigation. Research has demonstrated that professionals are able to maintain autonomy, dominance and power over other professions through their ability to create, legitimise and control knowledge and practice (Scott. 2008, Battilana. 2011). Professionals become socialised into professional groups throughout clinical careers, via the acquisition of knowledge, skills and dispositions, which influence how they practise in the future (Currie et al. 2012, Spyridonidis et al. 2016). Currie and colleagues (2012) described how professional groups are then able to define knowledge ownership and establish the body of knowledge which becomes important for their profession.

We sought to explore how socialised professional groups of surgeons, located within clinical communities and professional hierarchies, mobilise knowledge in practice. We set out to identify what constitutes knowledge for orthopaedic surgeons, how surgeons interact and mobilise knowledge in different organisational contexts, and how this influences the way in which orthopaedic services are delivered in the UK NHS. It is important to recognise the growing range of healthcare professionals who work in multidisciplinary teams to deliver musculoskeletal services. These professionals include nurses, physiotherapists, advanced care specialists, and orthopaedic department practitioners amongst others. This expansion of roles brings with it diversity in the knowledge of people who provide orthopaedic services, surgeons as a professional group represent one component part. In this study, it was important to capture and reflect this diversity. We collected data across a range of

professionals groups whilst framing the surgeon as the key actor in both the shared patient decision to operate and in the performance of surgery.

Less is known about knowledge mobilisation in professionalised clinical groups, and the weight attached to group-level knowledge in facilitating or impeding knowledge mobilisation. Here, we define group-level knowledge as knowledge shared across a network of members, who themselves act as sources of knowledge and contribute and participate in knowledge sharing (Sedighi et al. 2018). It is important to address this gap in understanding of group level knowledge mobilisation. Inappropriate variation in the practice of orthopaedic professionals has been linked to different approaches to networking, multidisciplinary team working and knowledge sharing (Briggs. 2015).

In this research we aimed to explore and describe how professionalised groups of surgeons, at the forefront of service delivery, mobilise knowledge in practice. To achieve this, we set out to examine groups of surgeons located in contrasting orthopaedic departments. We sought to demonstrate how the 'push' of codified knowledge exemplified through clinical guidance, interact in a complex network of individual clinicians, groups of professionals and hospital organisations, to produce a system where practice varies from the scientific evidence-based recommendations.

Methods

Study design and data collection

Multi-site, multi-method case studies were conducted in three UK hospital Trusts in the Midlands (Case A), North (Case B) and South West (Case C) of England. A hospital 'Trust' is an organisation providing secondary healthcare services to a locality within the English NHS. To identify how knowledge was acquired, interpreted and mobilised in orthopaedic surgery, we traced the implementation and use of orthopaedic National Institute for Health and Care Excellence (NICE) clinical guidance in each case. Across the NHS in England and Wales, NICE is responsible for the development of clinical guidance and guidelines on the use of new and existing treatments, medical technologies and surgical procedures. NICE recognise the need for professionals and practitioners to exercise their judgement and expertise, taking into account evidence-based recommendations alongside the individual needs, preferences and values of their patients or the people using their service (NICE. 2020).

The guidance we traced was entitled '*TA304 Total hip replacement and resurfacing arthroplasty for end-stage arthritis of the hip*', which was published in February 2014. This particular piece of clinical guidance was selected as its implementation was mandated in NHS services three months post publication. Therefore, we expected that each of the three cases would be in varying stages of their implementation processes at the time of data collection. Cases varied by their designation as a teaching hospital, a specialist trauma centre or their affiliation to an academic institution. Detailed case summaries are reported elsewhere (Grove et al. 2018). Case studies were conducted over 12 months (December 2014 - December 2015) and all data collected by one author (AG).

Ethical approval was secured at the host University and at each Trust. All hospitals consented to observations and all interview participants gave informed consent to take part in the study. Progressive focusing was used throughout data collected, as we drew on data from Case A to inform the data collection conducted in Cases B and C (Stake. 1995). An abductive approach to data collection was adopted through the multi-level collection and analysis of data which was informed by literature (Ferlie & Shortell. 2001, Pope. 2006). Abduction is a form of inference, whereby our explanations were generated through a combination of ideas deduced from previous literature, and induction from the findings which emerged through the cases (Mantere & Ketokivi. 2013).

Sixty-four interviews were conducted in total (A=18, B=19 and C=19) each lasting approximately 60 minutes. Participants included orthopaedic surgeons, allied health professionals, administrative staff, middle-level managers and hospital executives. Each interview was recorded digitally and transcribed by an external professional. In order to provide a national context, supplementary interviews were conducted with eight leading experts in evidence-based practice, healthcare policy and orthopaedics. Observations of day-to-day practice and daily staff routines were conducted over three-months at each hospital. This included observation of clinical practice, clinical and managerial meetings and informal conversations. Detailed field notes were recorded to capture how implicit knowledge was used and shared during clinical decisions, the dynamics between staff, their environment, the context in which knowledge was used and the observers' immediate reaction to observation events. A critical review of 121 supplementary documents was conducted to provide a wider understanding of hospital contexts. As a minimum, hospital quality reports, annual reports, papers from hospital boards meetings and orthopaedic

departmental meetings were obtained. In addition, local treatment policies and clinical pathways were collected.

Cross-case multi-level data analysis

Pawson (2019) emphasised the growing importance of within-case and cross-case analysis in implementation research, to ensure that methodological precepts achieve significance through their use in practice. In our study, data from each case were processed into text format prior to an abductive thematic analysis. Analysis followed the stages of data familiarisation, coding and development of categories from codes (Bernard & Ryan. 2010). Data examination was conducted by the authorship team. We focused on understanding what and which types of knowledge were privileged by practicing groups of surgeons at each hospital, and at which level knowledge mobilisation appeared to occur. Analytical rigour was enhanced by triangulating data across the three data sources, for example cross-checking what was reported during the interviews with observational field notes (Sandelowski. 1986).

Analysis of the cases was structured using the four levels of analysis described by Ferlie and Shortell (2001). Their depiction of multilevel approaches to change suggests that there are four levels which need to be considered in order to maximise the probability of change success. These four levels include: the individual, the group or team, the overall organisation, and the larger system or environment in which individual organisations are embedded (Ferlie & Shortell. 2001). We found this approach useful to frame our analysis as it recognises the interdependence of the various levels, and that different approaches to

knowledge mobilisation will be situationally determined within the context of specific organisations and environments.

The multiple levels represent the entirety of data collected and describe knowledge mobilisation of individual clinicians, surgical groups, the hospital organisations and larger healthcare system (Figure 1).

<Figure 1 here>

<Multi-level representation of knowledge mobilisation in orthopaedic surgery>

Data was analysed across the three cases using the roadmap method with divergent techniques (Eisenhardt. 1989). We sought to illuminate the reasons for variation found in orthopaedic practice therefore, searched for patterns and similarities in the data in order to expose the key dimensions of knowledge mobilisation in this context. Data were cross-checked within and across cases to ensure credibility of the findings.

Iterative cycles of analytical interpretation between the literature and empirical data were performed, to understand how knowledge mobilisation occurs within professional groups of surgeons. The emerging themes were systematically compared with empirical findings from each case independently to assess fidelity and to search for missing data. The final themes illustrate how knowledge was mobilised across the highly professionalised practice of orthopaedics in the organisationally-regulated context of healthcare.

Findings

The analysis revealed three themes: *1) Professional identities, 2) Knowledge acquisition, and the 3) Contextual contingencies of practice.* Together the themes represent key dimensions of knowledge mobilisation in orthopaedic surgery. A thematic description by Case is provided in the supplementary file Table 1*.*

Professional identities

Professional identities describe the process by which adopting a 'surgeon' identity, appeared to guide the characteristics and norms of the professionalised surgical groups and networks contained in our study. The surgeons in each case shared a highly specialised collective knowledge of orthopaedic surgery and its sub-specialisms. They seemed to have a propensity to privilege experiential knowledge of surgery over other available knowledge sources. When examining data across the cases, it emerged that surgeons were socialised into distinct professional identities which appeared to be specific to their particular organisation. This finding suggests that surgeon identities were cultivated in practice. As a professional group, the surgeons' held expert knowledge of surgery which was distinct from that held by other professionals working in the same organisation, or from orthopaedic surgeons located in other hospitals.

Observations revealed how individuals would label themselves first by their surgical sub-specialism, for example one surgeon would call himself "*the hip revision guy*" in conversation. Only when it was deemed important to emphasise organisational differences,

would surgeons specify the hospital in which they worked, for example referring to "*the way we practice here [elective service]*" compared to "*over-there [trauma service]*" (Observation note, Case B). Hence, the surgeons used their professional identities to distinguish themselves, their norms and their knowledge, from that held by professionals or professional groups.

Distinct professional identity practices were evident across all cases. The surgeons appeared to maintain a sense of prestige attached to their professional group when compared to a non-clinician-non-surgeons. This prestige seemed to influence how knowledge mobilisation occurred and therefore, how variation from best practice recommendations played out. The surgeon below describes their tacit understanding of *"what we do"* in orthopaedics, as not relevant to other forms of knowledge, such as scientific evidence:

"What we do in orthopaedics is largely evidence free, what we do… you can't really provide any evidence basis for, it's what's been done in surgery." (Clinician Interview, Case B)

Observations at Case A revealed a group of surgeons who exemplified an evidence-based surgeon identity. This group were distinct in how they discussed the value of scientific evidence in their daily work and routines. For these evidence-based surgeons, scientific knowledge was customary for informing and validating their clinical practice:

"The surgical team discuss a patient case, they refer to an ongoing clinical trial that is being conducted at other hospitals. The surgeon leading the discussion describes 'actively waiting'

the outcome of the trial to support their current treatment decisions around fixation of fractures." (Observation: clinical case planning meeting, Case A)

All the surgeons in our study prescribed to an orthopaedic surgeon identity. However, the process of privileging knowledge in diverse ways appeared to reflect how surgeons functioned within professionalised groups who could influence practice in their organisations. The significance attached to scientific evidence was most pronounced in Case A, but was largely lacking in Cases B and C where surgeons sought to maintain their specialist orthopaedic knowledge. Surgeons in Case A upheld principles of evidence-based practice and would describe how they *"stick together"* and form communities in their organisation where *"research evidence and guidelines are valued"* (Observation note, Case A). In turn, these valued forms of knowledge helped to drive an evidence-based practice agenda in their hospital, and became the foundation for local research networks:

"In our department, research is very openly discussed because we're a clinical academic department. We have to do it…evidence influences what happens in our hospital." (Clinician Interview, Case A)

In the other two cases, discussions of scientific evidence were not as prominent. Instead, the surgeons seemed to act as a dominant professional group who were able to assert control and authority to establish and then push their agenda regarding how, when and what type of knowledge should be mobilised in their organisation. One surgeon described that as a surgeon *"you're given quite a lot of autonomy"*. They went on to explain that the

practice of surgeons was accepted by others *"as long as you can justify it"*, later confirming

that in orthopaedics *"there's lots of ways to justify it" (Clinician Interview, Case C).*

Findings revealed how orthopaedic surgeons as a collective professional identity, were

inclined to privilege knowledge which originated from 'like-minded colleagues' over other

sources. Surgeons in Case B described *"the fallout"* when departmental managers requested

that budget restrictions, known internally as "*rationalisation",* should be factored into their

clinical decisions about what surgical implants should be used (Observation note, Case B).

Conversely, the apparent ease of sharing knowledge amongst orthopaedic colleagues who

had a common identity, was prominent throughout the findings. In the quote below, the

surgeon describes their ability to directly change the practice of surgical colleagues:

"I approached my key colleagues who do most of the surgeries here and said this is what I've

done and showed them what they should do."(Clinician Interview, Case C)

The influence of surgical identity illustrates the divide between knowledge emanating from

outside and inside the professional surgeon group. The socialisation of orthopaedic

surgeons into a professional identity was important for knowledge mobilisation, as

knowledge imposed from non-surgeon outsiders was more difficult to mobilise in practice.

The surgical/non-surgical sources of knowledge appeared to hold differential weight in the

minds of the surgeons, and therefore, existed in different knowledge spaces. The knowledge

from outside orthopaedics' was accorded less importance to the surgeons in this study.

Knowledge acquisition

This theme depicts the importance attached to situational learning, mentorship and factors which influence the acquisition and use of knowledge within surgical groups. We identified a collective language and understanding of what was important 'knowledge-in-context' for surgeons. There was variation across the cases in knowledge acquisition processes, which appeared to have a significant impact on the training of junior surgeons. The process of learning how to be a surgeon develops over time, beginning in medical school and extending into specialist training and consultant roles. The surgeons in our study described how they became 'indoctrinated' into a particular approach to practice, which they referred to as a "*surgical philosophy*" (Observation note, Case C). Their preferred approach, or philosophy, seemed to map onto where the surgeons routinely obtained knowledge for their work.

Across the cases, senior surgeons with strong allegiances to a particular surgical approach described training juniors in "*my way*" of practising. The academic surgeon quoted below, illustrates how knowledge acquisition through training contributes to the dominance and importance of scientific knowledge in their clinical setting:

"I've got 20 or 30 trainees at any time, the clinical trials stuff has been embedded in their training for as long as they can remember, it's normal. It is second nature to them" (Clinical Interview, Case A).

However, the knowledge acquisition we observed did not always align to conventional models of medical education and training. Within orthopaedics, acquiring new knowledge

appeared to centre on training group-level definitions of what is considered important knowledge in each specific context. The surgeons relied on acquiring the *"anecdotal experience and 'normal' practice"* of their colleagues to understand "*what works and what doesn't"* in their setting *(Clinical Interview 218016).* The findings suggest that knowledge mobilisation was a flexible and constantly changing process. Knowledge gained from surgical training could and was replaced as surgeons progressed in their careers, and moved between organisations. One newly appointed consultant in Case A described how they "*didn't really start learning until I started my consultant role in [hospital name]*". Therefore, defining what constitutes knowledge for surgery required an interaction between the knowledge of groups of surgeons, and the organisations in which they worked.

The ease of surgeon-to-surgeon knowledge acquisition extended outside of their immediate hospital groups, to orthopaedic professional societies such as the British Orthopaedic Association (BOA). The surgeons seemed to have an innate sense of belonging to their professional societies which made the acquisition of knowledge from these organisations simpler to achieve. One surgeon reported that the BOA "*one-page guidelines, have been really useful clinically"* when compared to the NICE clinical guidance which they suggested surgeons *"don't really know what to do with" (Clinical Interview, Case B).*

Professional societies appeared to strongly influence what was considered important knowledge for the surgeons in all three cases. Belonging to the profession meant that the knowledge boundaries were easily crossed, and societies were seen as organisations whose knowledge could be trusted, accepted and used. Unlike that of national guidance producing agencies. The quote below illustrates one surgeon's disconnect with NICE guidance:

"The steering group for that particular [NICE] guidance…well, there wasn't an overwhelming number of orthopaedic surgeons. You need to get a specialist society…the BOA, to look at it. Rather than having these totally random people and economists we don't connect with." (Clinician Interview, Case C)

During observations it became apparent that the surgeons who *"stand up and talk about evidence to other clinicians actually make it [evidence-based practice] happen, not the research team."* In field notes, we compared this knowledge acquisition process to "*good PR (public relations) really" (Observation note, Case A).* This comparison reflected the ease to which surgeons appeared able to demonstrate the value of scientific evidence to their audience. In a similar way to those working in public relations, these surgeons built a rapport and relationships with other surgeons and were able to engage their colleagues by 'telling the story' of their research. This finding was echoed in the interviews, when surgeons referred to senior society colleagues and research leaders who are able to ease the surgeon-to-surgeon acquisition of knowledge:

"You know you look at your senior peers who are doing well, so you go to meetings, such as society meetings and discuss with them, the ideas about what is best practice." (Clinician Interview, Case B)

Knowledge acquisition in the findings represented the process by which the professionalised groups of surgeons controlled who accessed and used within-group knowledge in practice. Across the cases, groups could consist of small departmental groups of surgeons, or wider

groups cultivated through membership of professional societies or research programmes. Whichever it were, the key signifier of group membership was ownership of the surgeon defined knowledge base.

Contextual contingencies of practice

The final theme depicts the capacity of each organisation to share and facilitate the sharing of knowledge within the context of organisational structures and external demands. The findings revealed how surgeons interacted within groups of colleagues using a shared understanding of local contingencies of practice, including the organisational capacity of their hospital. Surgeons helped to establish their individual and professional group norms, but they acquired contextually specific knowledge which was easily mobilised within their particular organisation. The surgeon below describes how working in a group, located in a hospital organisation, standardises their surgical practice:

"I think you are heavily influenced by your peers. But you are working in the confines of a hospital, so the more you work together the less novel your behaviour becomes…it's more standardised." (Clinical Interview, Case A)

Knowledge mobilisation in orthopaedics was also mediated by environmental factors such as physical location of staff and buildings. For instance, we observed *"differentiation across the two wards in Case B which created asymmetry in the information and knowledge used by the two distinct surgeon groups" (Observation note, Case B).* At Case B, the department

was physically separated across two buildings, who functioned as two separate teams (with different staff and processes) even though they technically were the same department. These differential approaches to knowledge mobilisation were evident across all cases, which appeared to depend on how orthopaedic departments were organised. Our observations revealed distinctions in the weight surgeons' attached to the knowledge of managers. This seemed to relate to the physical proximity of managers to surgeons. A field note described:

"Managerial staff did not know what was being discussed at meetings conducted in clinical spaces, 'the orthopaedic territory'. Managers had to travel to wards and were talked at using technical medical language… Distinct surgical/managerial territory acted as a knowledge divide which separated and elevated surgeons' talk from the managers."
(Observation note, Case C)

However, observations in Case A revealed how one manager infiltrated the surgeon group, which enhanced relationships and information sharing between the two groups of professionals. This particular manager was able to exist and function on the periphery of the surgical groups, but this was an uncommon finding. Managers at Case B and C described problems working across professional boundaries with orthopaedic surgeons, stating they are *"a difficult group to manipulate, a very difficult group to manage and manipulate. You've got to learn how to do it" (Manager Interview, Case B).* It became apparent that morale was low between the surgical and managerial teams. In some cases, C in particular, the relationship with management had become so difficult, it had completely broken down. Managers here described the stubbornness and inflexibility of surgeons to embrace change,

which led them to employ tactics to manipulate surgical practice. One manager described eliminating access to certain surgical implants by removing them from procurement lists and hospital storage rooms.

Access to knowledge in all cases was severely restricted by the professional knowledge boundaries between the clinical and non-clinical staff. This appeared to be confounded by the autonomy and power over knowledge held by the surgeon groups. One manager described how:

"… you can argue until you're blue in the face. We - at a senior [board] level are very convinced that reducing clinical variability is a good thing to do. But I certainly fail to convince the consultant body in this organisation that guidelines are a good thing."
(Manager Interview, Case C)

We identified entrenched professional hierarchies across all cases which enabled surgeons to maintain prestige and discretion over their practice. Surgeons were able to minimise and shift the responsibility for what they defined as "*non-orthopaedic work*" (e.g., guidance work) to elsewhere in their organisations (Observation note, Case C). This resulted in what appeared to be a lack of coherence regarding which professional groups were responsible for what organisational knowledge processes. For example, the responsibility for identifying and sharing new knowledge in clinical guidance was usually passed to low grade (NHS Band 2-3) departmental administrators and clerical staff who reported directly to the managers. The positioning of clinical guidance, as an administrative and managerial domain, appeared to dilute the importance of guidance to surgical colleagues. The surgeons perceived that the

responsibility for the implementation of clinical guidance lay elsewhere i.e., with the managers, not with themselves or their colleagues. The findings revealed that individual surgeons and surgical groups rarely engaged with administrative guideline processes. The instances when surgeons did get involved, they reported it to be *"not always a particularly pleasant thing, it's just a lot of nagging and negotiation" (Clinical Interview, Case B).*

One surgeon described their desire to be included in organisational decision-making because *"if clinicians don't take responsibility, then those people…who don't know what the clinical problems are… will make the wrong decisions." (Clinical Interview, Case A).* This highlights the tensions surrounding whose knowledge is considered important to support organisational decisions about surgery. Throughout the findings, managers appeared to be responsible for knowledge mobilisation linked to organisational targets and funding. Therefore, scientific knowledge was often ignored or dismissed by this group if it did not facilitate the achievement of organisational targets. One manager described that *"we have to really demonstrate we're compliant with NICE Quality Standards because we won't get any money if we don't.'" (Manager Interview, Case C).*

What appeared important for knowledge mobilisation was how the surgeon groups functioned within their organisations. The hospitals endeavoured to put boundaries around 'what' knowledge (clinical, managerial or organisational) and 'who's' knowledge (surgeons' or managers') was considered important. However, the surgeons in each case seemed able to flexibly broker these contingent factors when performing their surgical work, and rejected what they deemed to be less important. The restrictions and boundaries put in place by surgeon groups to define what was 'outside' the realm of orthopaedics functioned

to minimise the impact that knowledge from elsewhere could have on their practice. Whether knowledge originated from organisational managers and administrators, or from policymakers at a wider regulatorily level, greater weight was given to knowledge originating from inside the surgical speciality and this was the dominant motivator for practice.

Discussion

This study aimed to explore how socialised professional groups of surgeons, located within clinical communities and professional hierarchies, mobilise knowledge in practice. We set out to identify what constitutes knowledge for orthopaedic surgeons, how surgeons interact and mobilise knowledge in different organisational contexts, and how this influences the way in which orthopaedic services are delivered in the UK NHS. To achieve our aim, we conducted three case studies of orthopaedic surgical practice. We adopted a multi-level approach to analysis of these cases which was structured using four levels; individual clinicians, surgical groups, the hospital organisations and larger healthcare system (Ferlie & Shortell. 2001).

The findings are described through three themes which combine to illustrate how variation in orthopaedic practice emerged. We found that the following three factors influenced approaches to knowledge mobilisation: 1) the professional identity of the surgeon; 2) the ways in which approaches to knowledge acquisition played out in surgical work; and 3) the contingencies of practice in each hospital. Across the cases, we discovered that surgeons were constrained by their organisation's capacity to effectively mobilise knowledge in the

face of financial challenges, and regulatory pressures within the healthcare sector. Our findings align with the view that clinical guidance cannot be a substitute for expertise, collaboration, communication and authority when making clinical decisions (Timmermans & Angell, 2001, Palinkas et al. 2018). The majority of surgeons in our study rarely sought out scientific evidence as a preferred source of knowledge to guide their practice. Scientific evidence appeared to challenge the discretion exercised by surgeons and preferential knowledge was sought via their socialisation with colleagues and professional networks.

The key finding from our work is a demonstration of the substantial weight attached to surgical knowledge within the orthopaedic surgical speciality. Specifically, socialised group level knowledge which significantly influenced assumptions regarding what knowledge and whose knowledge became central to governing orthopaedic practice. Our findings highlight larger issues and concerns regarding the value added and pay off of current approaches to the mobilisation of knowledge within orthopaedic surgery. It is problematic that evidence-based approaches continue to be promoted and exemplified through the production and assumed implementation of clinical guidance. We found that this approach had limited impact in orthopaedic surgery. Our findings reveal that evidence-based practice did not function to incorporate scientific evidence into the dynamic knowledge brokering which occurred in real world practice of orthopaedics, where strong professional identities and contingent contexts exist.

Our findings reflect the flexible and contextually contingent knowledge mobilisation processes in orthopaedic surgery. This flexible approach represents a real-world depiction of evidence-based practice, where definitions of 'evidence' signified all components included

in the knowledge brokering processes of surgeons. The impact of scientific evidence seemed tenuous, and the assumption that guidance would become privileged knowledge, due to their prominent position in the traditional evidence hierarchy, was controversial (Harvey. 2013, Barnes et al. 2015). Consequently, the dynamic hierarchies of knowledge in orthopaedic surgery bore little relation to the traditional hierarchy of evidence promoted through evidence-based practice.

Our findings echo earlier organisational studies and clinical science research which depict the challenges of evidence-based practice, and the importance of social and organisational factors (Tagliaventi & Mattarelli. 2006, Davies et al. 2008, Grove et al. 2017, Pettman et al. 2020). However, our analysis extends previous research as we sought to enable context to be examined alongside the goals of evidence-based practice, such as how reductions in unwarranted practice variation can be achieved. The novelty of our work stems from our explanation building, which we have generated through our use of a multi-case, multi-method body of empirical evidence in the context of surgery. Our work represents a fundamental shift from the narrow foundations of single case analysis of guidance and guideline implementation, which tend to identify differences in the predispositions towards and subsequent behaviour with regards to evidence-based recommendations (Pawson. 2019).

Through our in-depth study of orthopaedic surgery, we demonstrate that implementing and achieving adherence to clinical guidance reflects not only on the people involved, but their roles, their networks, their organisations and the wider regulatory environments in which they work. We adopted within-case and cross-case analysis to tease out these influences,

with our comparisons chosen to reflect outcomes that may be generated in different organisations, who are expected to practice in an evidence-based fashion. Our investigation enabled us to demonstrate that the professional identities of surgical groups could advance or obstruct the mobilisation of evidence contained in clinical guidance, as evidenced by the stark contrast between Case A, where evidence-based practice appeared customary, compared to Case B and C where scientific evidence was seemly rejected or ignored.

Our findings have increased learning around evidence-based practice in orthopaedic surgery, which provides a platform for future research to examine the leverage that professional groups appear to possess when advancing evidence-based practice. In this study, we found that surgeons had become socialised into surgical identities within professionalised groups, who could share knowledge easily due to similar training, beliefs and attitudes as to what knowledge is privileged. Surgeons appeared to intuitively understand what it was to be part of their particular community and therefore, what knowledge was significant to that group. This illuminates an opportunity to modify practice via the surgeon-to-surgeon group mobilisation of knowledge. The findings demonstrate that when scientific evidence became normalised group knowledge, as in Case A, an evidence-based approach to practice can be fostered among colleagues and encouraged in the training of junior surgeons.

Equally, we found that evidence-based practice could be stymied when strong professional knowledge boundaries, enforced through clinical autonomy and professional hierarchies, severely restricted the integration of new external knowledge from outside the orthopaedic profession and orthopaedic group. This was reflected in the knowledge sub-cultures which

prevailed between clinical and non-clinical staff in Cases B and C. Unless external knowledge uptake was enforced via organisational or national regulation, the groups of surgeons working in these hospitals appeared resistant to improving practice through evidence-based knowledge acquisition. Professional groups in Case A seemed more receptive to crossing knowledge boundaries, which appeared to be a consequence of the physical proximity between clinical and non-clinical staff, and a seemingly joint appreciation of the importance attached to clinical guidance and scientific evidence across the surgical department.

Previous developments in evidence-based practice have reinforced the notion that individual value and preference judgments are needed, alongside scientific evidence to make effective clinical decisions (Grove et al. 2017). However, this notion presupposes that scientific evidence is first considered a valuable source of knowledge for frontline clinicians. In our study, knowledge that was deemed important was defined and privileged within the professional surgeon groups. Group level knowledge was central to practice and generated contingent knowledge mobilisation. This helps to rationalise why variation in practice might exist, and demonstrates the challenges of applying the context free claims of the hierarchy of evidence to orthopaedics.

Implications for research, policy and practice

Research is needed into the most effective routes to enhance knowledge mobilisation in healthcare to encourage a reduction in unwarranted practice variation. The approaches to knowledge mobilisation observed in our study, revealed that the knowledge considered important for practice can and does change often. Therefore, an understanding of the

practice context in which knowledge is expected to be mobilised is essential. We found that surgical groups could deviate from evidence-based recommendations to achieve improved patient outcomes. We found examples of positive variation, where surgeons delivered high quality services which met system level requirements, because clinical decisions aligned to their particular contextual constraints. This finding demonstrates the need for more nuanced understanding of apparent practice variation.

For orthopaedics, our findings highlight that knowledge contained and mobilised within groups is a key target area for improvement. Group level knowledge had a large impact on how knowledge moved between individual clinicians and across groups. An important next step is to investigate how to optimise knowledge mobilisation within surgical groups, to facilitate the uptake of scientific evidence in practice. Identifying the receptive contexts for change within professional groups (Pettigrew et al. 1992), alongside the effective levers for change which work across all contexts, i.e., regulation, would provide insightful.

Next steps would require an examination of organisational learning and knowledge acquisition processes within organisations to increase the capacity of hospitals to identify, integrate, and use knowledge across all levels of practice. This would entail focusing on groups as a key mechanism of change, but in their interaction with individual clinicians, the organisations and the wider environment, to span the entire knowledge domain. Single interventions targeted at individual clinicians, or organisational protocols developed by departmental administrators, were unable to achieve meaningful change in this study, because they focused on one specific type of knowledge at one level.

Our findings have implications for healthcare organisations beyond England who are expected to practice using an evidence-based approach. For international privately funded or public-private funded systems, our research highlights the need to understand the type of targeted knowledge mobilisation strategies managers and policymakers could adopt to achieve implementation of best practice recommendations. Adopting a comprehensive and contextually dependent view of knowledge mobilisation, will help to identify the different types of knowledge which exist in practice, and those which positively and negatively influence patient care.

Strengths and limitations

The core strength of our work is the use of multi-case mixed-method case studies. This enabled us to achieve a depth of analysis to allow us to begin to unpick the variation in practice, that routinely follows clinical guidance implementation. In our study, we favoured depth of investigation over breath of cases. Consequently, the limitation of our study could be attributed to the small number of cases we selected. To combat this, we sought to describe three distinct types of hospital Trust to represent a range of hospital providers in the UK. We considered that we were successful in this aim. We argue that are approach to case selection ensures the findings have strong internal validity, and therefore, are transferable at a higher conceptual level when considering the influence of the different levels at which knowledge mobilisation occurs in orthopaedic surgery.

Conclusion

This paper provides an empirical multi-case mixed-method analysis of knowledge mobilisation to explore and describe the use of clinical guidance in three orthopaedic departments in NHS hospitals in England. Thematic analysis of the findings identified three key dimensions of knowledge mobilisation which influenced orthopaedic practice. These were; *1) professional identities, 2) knowledge acquisition and, 3) the contextual contingencies of practice*. The key finding from this study is a demonstration of the substantial weight attached to socialised surgical knowledge within the orthopaedic speciality, which significantly influenced and governed orthopaedic practice. The study provides evidence to suggest that the standard approaches used to bridge the gap between what occurs in real-world orthopaedic practice and evidence-based recommendations, remain ineffective.

The research found that the hierarchies of knowledge in the practice of orthopaedic surgery bore little relation to the hierarchy of evidence, which is foundational to the production of clinical guidance and guidelines. Knowledge defined and privileged within professional surgeon groups was central to practice and generated contingent knowledge mobilisation. This helps to rationalise why variation in practice might exist and demonstrates the challenges of applying the context free claims of the hierarchy of evidence to orthopaedics. The study provides a platform for future research, to examine the leverage professional groups may have when advancing the use of scientific evidence in practice.

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