Using Twitter to mobilise knowledge for First Contact Physiotherapists - A qualitative study

Laura Helen Campbell

Master of Philosophy (MPhil)

Keele University

June 2023

Abstract

Background - First Contact Physiotherapists (FCPs) specialise in supporting people who consult with musculoskeletal conditions in National Health Service primary care. Cited FCP role challenges include professional isolation, time demands and changing professional and policy contexts.

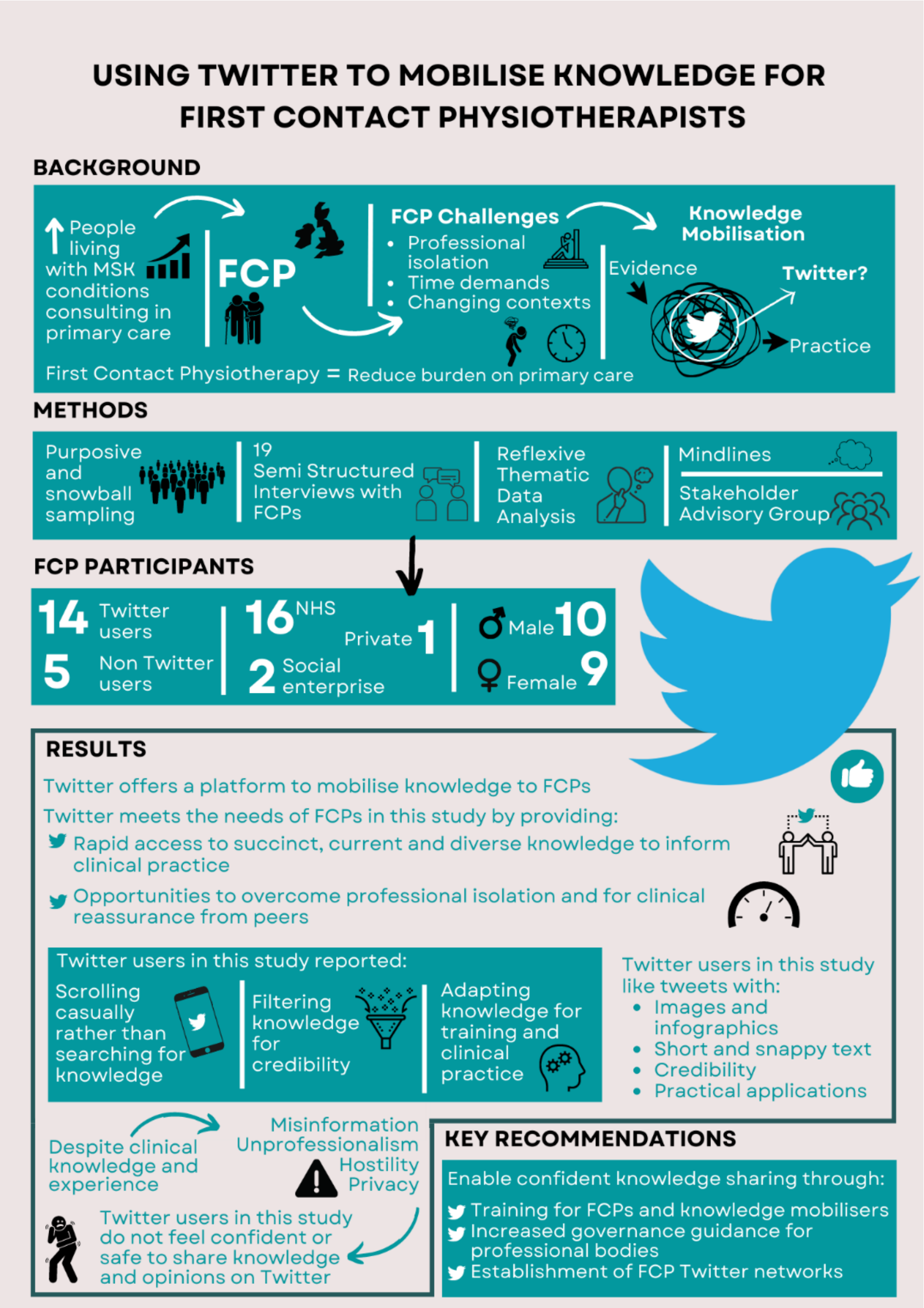
The evidence-to-practice gap is the delay between research knowledge being created and subsequently used in clinical practice and can result in patients not benefiting from healthcare advances. Knowledge mobilisation aims to close this gap by using different types of best available knowledge to support clinical decision making and optimise care. Twitter, though commonly used, has not yet been explored as a source of knowledge to inform FCP clinical practice.

Methods - Semi-structured interviews with UK musculoskeletal FCPs (n=19) took place following purposive and snowball sampling. Data were analysed thematically and the knowledge mobilisation mindlines model was selected as a lens through which to further interpret the data. A Stakeholder Advisory Group including public members informed the study methods, topic guides and dissemination of the findings.

Results - This study demonstrates how Twitter can meet FCP needs by providing rapid access to succinct, current and diverse knowledge to inform clinical practice. Twitter provides opportunities to overcome professional isolation and for clinical reassurance from peers. FCPs casually scrolled for knowledge, needed to filter knowledge for credibility and appreciated tweets with images or infographics. FCPs adapt knowledge from Twitter for offline training and clinical practice, however despite their clinical expertise and experience, most did not feel confident or safe to share their own knowledge and opinions online. This was due to witnessing ‘unprofessional’ and hostile behaviour online and misinformation and privacy concerns.

Conclusions - Twitter offers a platform to mobilise knowledge to FCPs. Recommendations to enable confident knowledge sharing include FCP and Knowledge Mobiliser training, governance guidance for professional bodies and establishment of FCP Twitter networks.

Visual abstract



USING TWITTER TO MOBILISE KNOWLEDGE FOR FIRST CONTACT PHYSIOTHERAPISTS

BACKGROUND

↑ People living with MSK conditions consulting in primary care

FCP

FCP Challenges
- Professional isolation
- Time demands
- Changing contexts

Knowledge Mobilisation

Evidence

Twitter?

Practice

First Contact Physiotherapy = Reduce burden on primary care

METHODS

Purposive and snowball sampling

19 Semi Structured Interviews with FCPs

Reflexive Thematic Data Analysis

Mindlines

Stakeholder Advisory Group

FCP PARTICIPANTS

14 Twitter users

5 Non Twitter users

16 NHS

Private **1**

2 Social enterprise

♂ Male **10**

♀ Female **9**

RESULTS

Twitter offers a platform to mobilise knowledge to FCPs

Twitter meets the needs of FCPs in this study by providing:

- Rapid access to succinct, current and diverse knowledge to inform clinical practice
- Opportunities to overcome professional isolation and for clinical reassurance from peers

Twitter users in this study reported:

Scrolling casually rather than searching for knowledge

Filtering knowledge for credibility

Adapting knowledge for training and clinical practice

Twitter users in this study like tweets with:
- Images and infographics
- Short and snappy text
- Credibility
- Practical applications

Despite clinical knowledge and experience

Misinformation
Unprofessionalism
Hostility
Privacy

Twitter users in this study do not feel confident or safe to share knowledge and opinions on Twitter

KEY RECOMMENDATIONS

Enable confident knowledge sharing through:
- Training for FCPs and knowledge mobilisers
- Increased governance guidance for professional bodies
- Establishment of FCP Twitter networks

Table of contents

List of tables

List of figures

Plain language summary

The number of people with long-term painful conditions affecting muscles, bones and joints is increasing. These musculoskeletal (MSK) conditions can impact on people's daily activities, wellbeing, social life and work. First Contact Physiotherapists (FCPs) are a new specialist health care role in the UK National Health Service (NHS) created to support people with these conditions based in primary care. Patients can see these specialists without needing to see their General Practitioner (GP) first.

FCPs need to find and share the most up-to-date research findings to best-treat their patients. However, it can take many years for research findings to become part of everyday patient treatment. "Knowledge mobilisation (KM)" is the term used to describe a way of building relationships and sharing different types of knowledge more quickly and efficiently. "Knowledge Mobilisers" are the people who do this work. Types of knowledge include research, patient experiences and healthcare professional guidance and training. One potential route for KM is through Twitter - a free social media network, which is popular for both Health Care Professionals (HCPs) and patients. Twitter allows users to communicate with others across the world, through short, public messages, called 'tweets.' Tweets can include text, images, videos and links to other websites. However, there is a lack of published information about if, how and why FCPs use Twitter. We do not know if they use it to find and share current information with their colleagues about treating patients with muscle, bone and joint problems.

This study therefore aimed to find out more about what FCPs think and feel about using Twitter. This study also aimed to support Knowledge Mobilisers to communicate research evidence to FCPs via Twitter.

The study had four objectives:

1. To explore the perceptions and experiences of FCPs about how knowledge accessed via Twitter is used in clinical practice
2. To understand how Twitter may (or may not) be used by FCPs to access knowledge for clinical practice and the factors that influence its use
3. To determine what type of tweet format best communicates knowledge to FCPs
4. To provide Knowledge Mobilisers with deeper insight and understanding on effective translation of research to FCP practice via Twitter

To meet these objectives, 19 FCPs from across the UK took part in an interview and 14 participants used Twitter, five did not.

Analysis of the interview data showed that Twitter gives busy FCPs a quick and easy way to find different types of knowledge for their clinical practice. Twitter provides opportunities for FCPs to connect with their peers to overcome the isolation of their roles and to find reassurance about their clinical practice. FCPs casually scroll through information on Twitter to see if they can find useful knowledge which could be used offline for training or in their clinical practice. However, despite being very experienced and knowledgeable healthcare professionals, many of the FCPs who were interviewed did not actively post or share knowledge on Twitter. This was because they were concerned about issues of professional conduct, hostility from other Twitter users, misinformation and personal privacy. For the FCPs who were interviewed who used Twitter, it was important to find trusted knowledge. They preferred this knowledge to be short and to include images.

These findings suggest that Twitter may be a good way to share knowledge with FCPs to be used in their clinical practice. Training could help FCPs and Knowledge Mobilisers to feel more confident to use Twitter to share knowledge. Guidance for physiotherapy professional organisations could help FCPs to feel more supported and protected online. FCP networks on Twitter may encourage more knowledge sharing online.

Glossary of terms and concepts

Advanced Clinical Practitioners - Advanced Clinical Practitioners (ACPs) come from professional backgrounds such as nursing, pharmacy and occupational therapy. ACPs are educated to Master's level and have skills and knowledge for expanded roles of caring for patients across four 'pillars' of advanced practice – clinical, education, leadership and management, and research (Health Education England, 2017).

Community of Practice – A group of people "who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger, McDerott and Snyder, 2002, p4).

Dissemination - The active movement of knowledge from a source to the knowledge users, this is a linear process of knowledge movement (Lomas, 1993).

Echo chambers – a situation in which the same ideas and opinions are repeated over and over again. Alternative or competing ideas and opinions are not considered, reinforcing the same beliefs and encouraging bias. Common on social media, where website algorithms can track a user's online engagement and use the results to primarily show that user similar content, preventing them from being exposed to new perspectives and knowledge (Brugnoli *et al.,* 2019, Cinelli *et al.,* 2021).

Emoji – simple, small visuals which are embedded in text and used in electronic messages and web pages.

Evidence-Based Practice (EBP) / Evidence-Based Medicine (EBM) – Evidence-based medicine (also referred to as evidence-based practice for professions outside of medicine) is described as the "conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients" (Sackett *et al.*, 1996, p71). EBM combines the best available research evidence with clinician experience, healthcare context and patient preferences.

Evidence-to-practice gap - The delay between empirically generated research knowledge in academia being taken up and used in clinical practice (Cooksey, 2006; Currie, Kiefer and Spyridonidis, 2020).

First Contact Physiotherapists (FCPs) –Physiotherapists with enhanced skills, based in primary care. They assess and diagnose musculoskeletal conditions, give advice on condition management, and refer people on to see specialist services if needed. FCPs are 'first contact' meaning that patients do not need to see their GP first. The use of the term FCP in this thesis relates specifically to First Contact Physiotherapists, a term also used by the Chartered Society of Physiotherapists (CSP), and not First Contact Practitioner, which can be used to describe any registered health professional who is the first point of contact for patients. The abbreviation FCP can also mean First Contact Practitioner. For this thesis, FCP will refer to First Contact Physiotherapist.

FCP roadmap – Health Education England have produced an MSK roadmap to education for practice for FCPs and Advanced Practitioners in primary care, known as the ‘FCP roadmap’ amongst FCPs (Health Education England, 2021a), to support FCP role progression to advanced practice in primary care.

General Practice – Traditionally based in local towns, villages and cities across the UK, General Practice is the name given to services provided by General Practitioner (GP) surgeries, within primary care settings. GP surgeries offer a first point of contact for patients to the healthcare system.

Health Education England (HEE) – A UK Government department that delivers education and training to the NHS workforce.

Impact Accelerator Unit (IAU) – A specialist knowledge mobilisation unit within Keele University’s School of Medicine (UK). The IAU works towards closing the evidence-to-practice gap, by accelerating both the uptake and impact of research evidence into clinical practice. The IAU works with academic, clinical, public, commissioning and charity stakeholders to co-produce practical solutions and innovations.

Implementation Science – The scientific study of how to enable the systematic uptake of evidence-based knowledge and research findings into practice and facilitate understanding for people to implement an intervention successfully (Eccles and Mittman, 2006).

Knowledge mobilisation (KM) - Moving knowledge to where it can be at its most useful (Ward, 2017), by actively creating, sharing and using different types of the best available knowledge (Powell, Davies and Nutley, 2017), within a given context, so that the right information gets to the right people, at the right time and in the right format (Levin, 2008). KM is a social process that involves two way relationships (Davies, Powell and Nutley, 2015), is complex and messy (Graham *et al.*, 2006), and considers stakeholder needs and drivers in order to transform the best available knowledge and evidence into practice.

Link Group – The Link Group champions high quality Patient and Public Involvement and Engagement in implementation and knowledge mobilisation activities in the Impact Accelerator Unit, School of Medicine, Keele University. It consists of members of the public with networks and links to NHS, voluntary, community and charitable groups. The Link Group offers valuable insight and personal connections with public facing groups, increasing the effective mobilisation of knowledge beyond clinical stakeholders.

Lurking – Lurkers make up the majority of social media users and contribute little or no content to a platform; they consume knowledge, but they do not (or very rarely) post knowledge online, although they often actively share knowledge sourced online in offline environments (Cranefield, Yoong and Huff, 2015).

Mindlines - “Internalised, collectively reinforced and often tacit guidelines that are informed by the clinician’s training, by their own and each other’s experience, by their interactions with their role sets, by their reading, by the way they have learnt to handle the conflicting demands, by their understanding of local circumstances and systems, and by a host of other sources" (Gabbay and Le May, 2011, p44).

Musculoskeletal (MSK) conditions – These are conditions affecting muscles, joints and bones.

Patient and Public Involvement and Engagement (PPIE) – means proactive partnership working with patients and the public in all stages of research, from prioritisation of questions and funding applications through to designing and managing studies and implementing research. PPIE members are increasingly co-investigators on research. PPIE involves working 'with' and alongside members of the public collaboratively; PPIE members are not research participants, research is not done 'to' them, neither is research conceived and carried out 'for' them, without them. Public members can include patients, carers, family members of patients, health and social care service users and representatives from charities or groups. They offer their expertise of their own experience, making sure research is relevant, appropriate and suitable for everyday clinical practice.

Primary care – Primary care services are usually the first place that a person comes into contact with the healthcare system. Professional roles in primary care settings include General Practitioner (GP), Pharmacist, General Practice Nurse and First Contact Physiotherapist. Primary care differs to secondary care, which covers services based in hospital settings.

Public Health England (PHE) – The role of Public Health England was to protect and improve health and wellbeing and reduce health inequalities in the UK. It was replaced on October 1st 2021 by two organisations; the UK Health Security Agency (UKHSA) and the Office for Health Improvement and Disparities, which are both part of the government Department of Health and Social Care.

Secondary care – People usually go to secondary care services when they have been referred by their GP or other primary care professional. Secondary care is more specialised and often provided in hospitals.

Social media – Social media are the tools and platforms for the interactive sharing of user-generated content (Markham, Gentile and Graham, 2020) via social networks online to large audiences. Facebook, LinkedIn, Instagram and Twitter are examples of social media platforms.

Twitter – an online social media and social networking platform where people communicate in short messages of 280 characters, called tweets. Tweets can include images, videos, links to other websites and polls. Twitter is an open, unregulated, public forum, which is free to use and reaches across the globe.

List of thesis abbreviations

AfC – Agenda for Change

ACP – Advanced Clinical Practitioner

AHP – Allied Health Professional

CoP – Community of Practice

CSP – The Chartered Society of Physiotherapy

FCP – First Contact Physiotherapist (Note: this can also mean First Contact Practitioner. For this thesis, FCP will refer to First Contact Physiotherapist)

GP – General Practitioner

GPN – General Practice Nurse

HCP – Health Care Professional

KM – Knowledge mobilisation

MSK – Musculoskeletal

MS Teams – Microsoft Teams

NHS – National Health Service

PPIE – Patient and Public Involvement and Engagement

SAG – Stakeholder Advisory Group

Outputs related to this thesis

Oral presentations

Campbell, L. (2021) Twitter for Knowledge Mobilisation- presented at the Keele University Faculty of Medicine Postgraduate Conference

Campbell, L. (2022) Twitter for Knowledge Mobilisation – presented at the Impact Accelerator Unit, Keele University, Research Group meeting

Campbell, L. (2022) Twitter for Knowledge Mobilisation - presented at the West Midlands Knowledge Mobilisation Forum

Campbell, L. (2022) Twitter for Knowledge Mobilisation - presented to the Link Group

Campbell, L. (2023) The role of Twitter in primary care clinical practice - presented at the Keele University Postgraduate Symposium 2023

Abstracts

Campbell, L., Quicke, J., Stevenson, K., Swaithes, L. (2023) Helping to address primary care challenges by using Twitter to access and share knowledge for First Contact Physiotherapy – accepted for Oral Presentation at Health Services and Delivery UK conference 2023

Campbell, L., Quicke, J., Stevenson, K., Swaithes, L. (2023) Helping to address primary care challenges by using Twitter to access and share knowledge for First Contact Physiotherapy - submitted to Physio UK conference

Campbell, L., Quicke, J., Stevenson, K., Swaithes, L. (2023) Using Twitter to Mobilise Knowledge for First Contact Physiotherapists – accepted for poster presentation at the UK Knowledge Mobilisation Forum conference 2023

Awards

Campbell, L. (2023) The role of Twitter in primary care clinical practice – Awarded runner up prize for Best Oral Presentation in the Faculty of Medicine and Health Sciences at the Keele University Postgraduate Symposium 2023

Masters credits

Completion of Knowledge Mobilisation professional short course, University of the West of England, 15 credits level 7 module. Passed with 76%.

Funding acknowledgements

Laura Campbell is part funded by the National Institute for Health and Care Research (NIHR) Applied Health Research Collaboration (ARC) West Midlands (NIHR 200165) and support for the MPhil was given through an NIHR Senior Investigator award (ID NIHR 200259) Professor Krysia Dziedzic

Acknowledgements

I would like to thank the research participants who gave up their precious time to share their thoughts and ideas with me. I would also like to thank members of the Stakeholder Group and the Link Group for their insight and interest in this work; they helped me to think differently, focus my ideas and be more confident. An acknowledgement also to John Gabbay and Andrée le May, who took the time out of their busy schedules to talk to me about mindlines. I have learned so much from your expertise and wisdom - thank you.

Many thanks to my supervisors and colleagues Dr. Laura Swaithes, Dr. Jonathan Quicke and Professor Kay Stevenson for their expertise and guidance throughout this study, especially for their support during COVID-19 lockdowns. I would also like to thank my colleagues and friends in the Impact Accelerator Unit, including the unit's director Professor Krysia Dziedzic, for continued support, positivity and confidence in me. Without them, not only would this MPhil not be possible but I would never have had the confidence to go for it. I have been very lucky to work in such an exciting, engaging environment with such knowledgeable and nurturing people. A special thank you to Helen Duffy who has been a wonderful mentor and friend, always there to listen and to encourage me to go for new opportunities. Thank you for helping me to grow.

Finally, this thesis is dedicated to my wonderful Mum and Dad, Jamie and Robin - thank you for all your unwavering love, support and patience throughout everything and for always reminding me to reach for the stars. I'm very lucky to have you all.

Chapter One: Introduction

1.1 Thesis introduction

Despite having 486 million monthly users worldwide in 2022 (Kemp, 2022), little is known about using Twitter as a strategy to mobilise knowledge to Healthcare Professionals (HCPs) such as First Contact Physiotherapists (FCPs). This knowledge mobilisation (KM) thesis presents a semi-structured interview study conducted with 19 FCPs between 2020 and 2022, which explores their experiences and perceptions about using Twitter as a source of knowledge to inform their clinical practice.

This introductory chapter begins by providing the context for the development of this MPhil study and outlining the thesis structure. This is followed by an introduction to the key concepts from the literature relevant to this thesis, before presenting the research question, aim and objectives.

1.1.1 Context to thesis development

The Impact Accelerator Unit (IAU) at Keele University is an interdisciplinary team consisting of individuals with varied expertise and knowledge of local contexts and research-based evidence. The unit works collaboratively with stakeholders to facilitate the mobilisation of knowledge into clinical practice, with the aim of accelerating both its uptake and impact into public health, health and social care. It aims to close the evidence-to-practice gap (the delay between the generation of research evidence and its use in clinical practice) using KM strategies.

The MPhil candidate works as a Knowledge Broker within the IAU team, developing communications strategies for effective KM and working with the unit’s stakeholders to co-create evidence-based patient information. This includes co-creating leaflets, animations and waiting room slide sets which are engaging and understandable for patients, useable and easily sourced for HCPs and contain up to date evidence-based information. Many of these are promoted via Twitter. Patient and Public Involvement and Engagement (PPIE) for the School of Medicine is a large part of the IAU’s remit and the candidate leads the Link Group, a group of public members who support KM, implementation and impact work with the unit.

The broad ideas for this study regarding how social media could be used most effectively for KM in the management of musculoskeletal (MSK) conditions were conceived in 2019 by JQ. Discussions also took place during an academic journal club around how physiotherapists access information on Twitter. The IAU had also begun to provide training for FCPs and had close links with both HCPs and researchers in this field. Social media was already anecdotally known to be a platform for KM, providing an opportunity for HCPs and the public to directly access a variety of healthcare related knowledge about MSK conditions. Twitter, in particular, had been used by the IAU as a way to engage with stakeholders and communicate evidence outwards. However, little was known about how HCPs access, scrutinise and use information accessed via social media for clinical practice. Potential research question ideas were then shaped by LC, JQ, LS, and KS, who refined them in the context of an MPhil study that aligned KM, clinically important FCP questions and the needs of the IAU.

1.1.2 Overview of thesis structure

This thesis is divided into five chapters, illustrated visually in Figure 1: Overview of thesis structure.

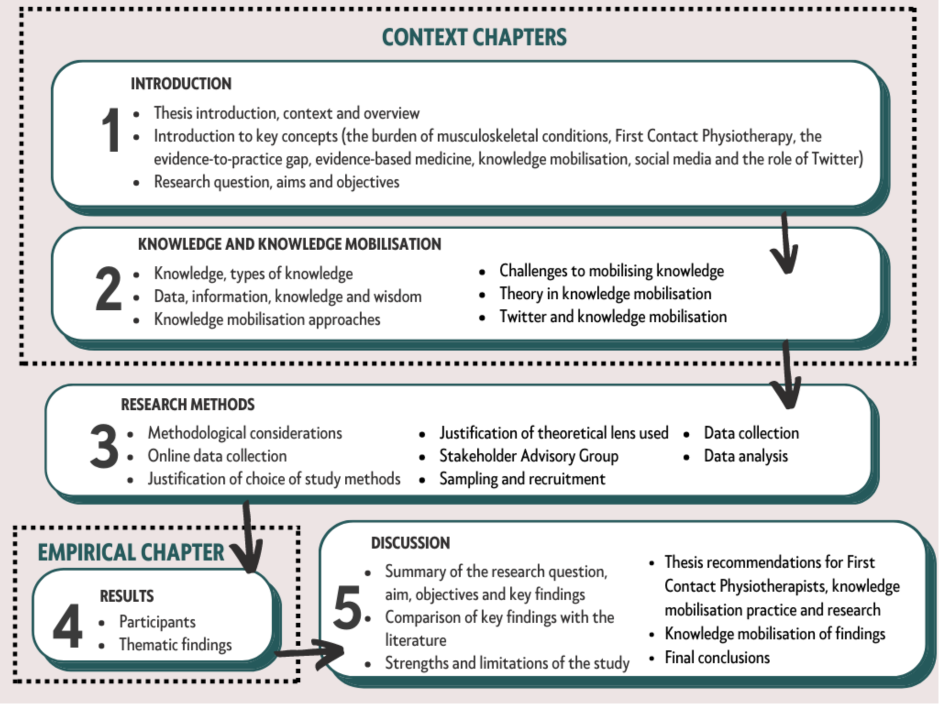


Figure 1: Overview of thesis structure

Chapters one and two provide the context to the study, exploring existing literature relevant to the research question and situating the study within the practical and theoretical field of KM. Chapter three goes on to provide the initial considerations and final choice of methods used to answer the research question and justification for the KM theory chosen to provide an additional theoretical lens through which to interpret the data. It then goes on to provide detail of sampling and recruitment, data collection and data analysis methods used as well as description of stakeholder engagement and ethical considerations. The empirical part of the study is presented in detail in chapter four, which explores the results of the semi-structured interviews. These findings are then discussed in more detail in chapter five, in relation to the contextual background set out in the initial chapters with comparisons drawn with the existing literature. The final chapter also considers study strengths and limitations before making overall conclusions and recommendations for FCPs, KM practice and research.

1.2 Introduction to key concepts

The following section will introduce the key concepts relevant to this thesis and present the relevant literature in each area, in order to provide context.

1.2.1 The burden of musculoskeletal conditions

There is consensus across the literature that MSK conditions are a common and urgent global concern for primary care (Vos *et al.*, 2017; Briggs *et al.*, 2018). Approximately one in three people now live with a long term, painful MSK condition worldwide (Briggs *et al.*, 2018); conditions which are rapidly becoming a leading cause of years lived with disability (Vos *et al.*, 2017; Murray, 2018). There are approximately 200 types of MSK conditions affecting joints, bones, muscles and the spine (Arthritis and Musculoskeletal Alliance, 2021) which can cause distressing and unpredictable physical symptoms of pain, stiffness, fatigue, mobility and dexterity problems, permeating all aspects of a person's everyday life (Versus Arthritis, 2021; Thomas *et al.*, 2021). In addition to physical symptoms, people with persistent, chronic MSK conditions are twice as likely to feel anxious or depressed compared to those without (Versus Arthritis, 2021). Factors such as smoking, poor nutrition, an ageing population, social deprivation and excess alcohol consumption are exacerbating the problem (Versus Arthritis, 2021). Excess weight and a lack of activity are significant factors in developing MSK conditions, despite the fact that regularly keeping as active as possible is important for MSK health and can reduce the risk of pain, depression, falls and fracture (Versus Arthritis, 2021). MSK burden may be increasing more than previous years. More recently, COVID-19 could have had a negative effect on people with MSK conditions, for example lockdowns may have reduced access to healthcare services and opportunities for physical activity (Quicke *et al.*, 2022).

The burden of MSK conditions does not solely rest on individuals, there are significant consequences for the wider society and healthcare systems. Difficulties in a person's working life due to MSK conditions can consequently have a negative impact on employers and the national economy through time off work and benefits claims. In 2018, almost 20% of days lost to sickness were due to MSK conditions; only second to coughs and colds (Office for National Statistics, 2019), costing the UK economy around £7 billion a year (Public Health England, 2019). Furthermore, £8.6 billion is annually spent on benefits to support people with MSK conditions (Department of Work and Pensions, 2016). In healthcare systems, the majority of MSK care is still provided by GPs and MSK conditions now make up one in three GP consultations in English primary care (Versus Arthritis, 2021), yet in comparison with secondary care, primary care has been underfunded over many years (NHS England, 2014). It is clear that GPs are under significant pressure to respond to this burden and staffing provision is struggling to keep up with MSK demand. In a timely five-year research study undertaken by The Kings Fund looking into GP pressures, it was found that although the number of patients consulting to UK GP practice grew by 15% between 2010 and 2015, the numbers of General Practitioners (GPs) and General Practice Nurses (GPNs) grew by only 4.75%, and 2.85% respectively (Baird *et al.*, 2016).

In NHS General Practice (GP), more emphasis is now being placed on the roles of wider primary care staffing, such as Advanced Clinical Practitioners (ACPs), medical assistants, mental health therapists, reception and clerical staff, physiotherapists, pharmacists and physician associates (NHS England, 2016) to spread the burden. Yet a slow pace of recruitment and worsening staff retention has interfered with plans to roll out these professionals at the necessary scale (Buchan *et al.*, 2019), leading to the primary care workforce being described as “stretched beyond capacity” with “staff morale at a record low” (Fuller, 2022, p. 2).

1.2.2 First Contact Physiotherapy

FCPs are specialist MSK HCPs who assess patients with muscle, bone and joint pain and make decisions on their diagnosis and management of care without the patient needing to see their GP first (Chartered Society of Physiotherapy, 2018). FCPs have a broad range of MSK clinical expertise and experience and are able to identify red flags (potentially serious conditions) and masquerading conditions (where one condition presents like another) order scans and tests, and add patients to waiting lists for surgery (Stynes, Goodwin and Bishop, 2020). Some can prescribe medication and give joint injections. FCPs differ from ‘direct access physiotherapy’ (or self-referral to a physiotherapy department) because they are described as being a part of a primary care team (Langridge, 2019). The FCP role has evolved in response to the growing insight that an ageing population with increased complex health needs required more support for people with multiple health conditions, more locally delivered care, more investment in primary care, and more support for staff development, including ‘multispecialty’ models of care consisting of nurses, therapists and community based professionals (NHS England, 2014). The role’s evolution is illustrated in more depth in Figure 2: Development of the First Contact Physiotherapy role.

It is important to distinguish between First Contact Practitioners and First Contact Physiotherapists. The term First Contact Practitioner (or Advanced Practitioner) in primary care is often used interchangeably with First Contact Physiotherapist, however it can also be applied to other ‘first contact’ roles, such as paramedics (Health Education England, 2021b). In this thesis, the term First Contact ‘Physiotherapist’ will be used in line with recommendations from the Chartered Society of Physiotherapy (CSP), which ensure that patients are fully informed about who they are seeing and relates specifically to the treatment and management of MSK conditions in primary care. Furthermore, the term physiotherapist is a protected title which is regulated by the Health and Care Professions Council (HCPC) (Chartered Society of Physiotherapy, 2022b).

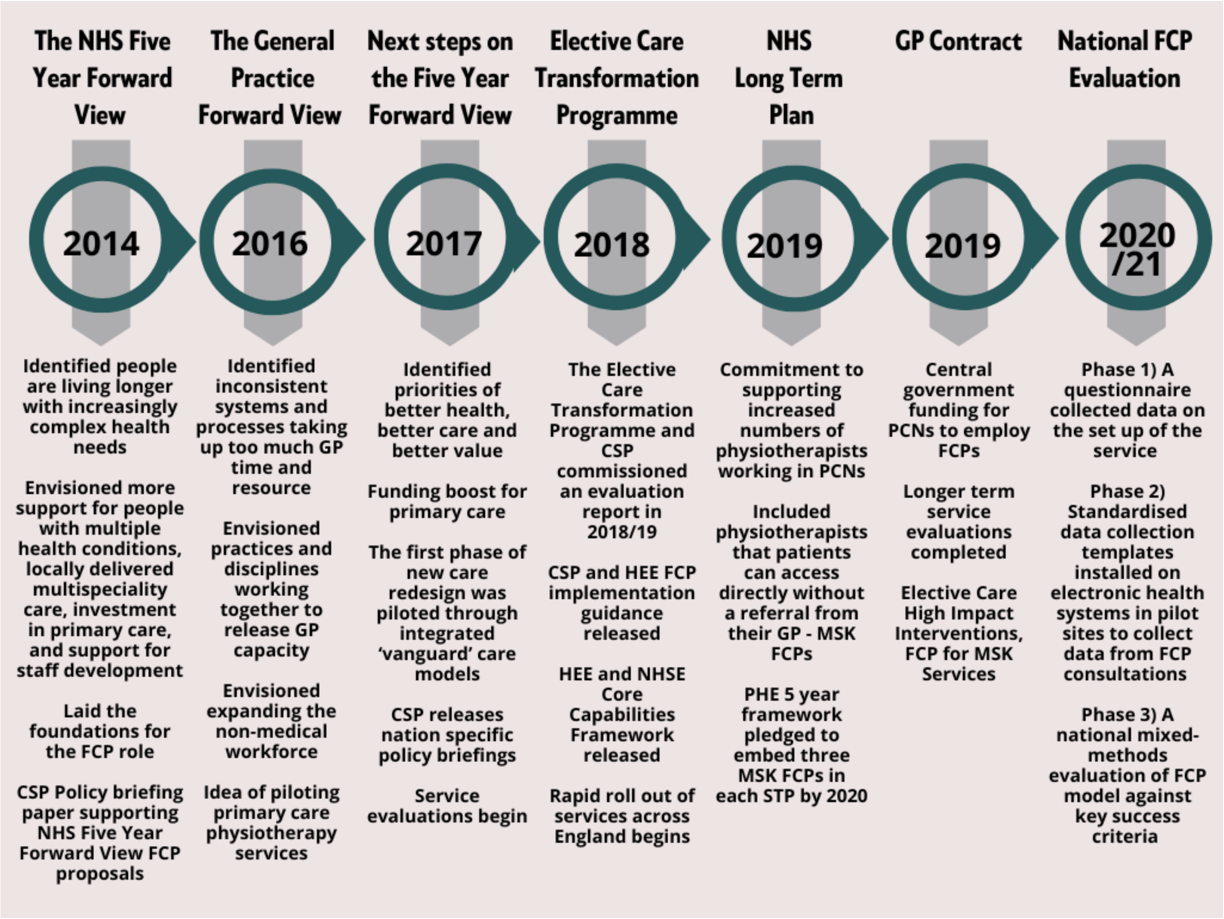


Figure 2: Development of the First Contact Physiotherapy role

The NHS Five Year Forward View

2014

Identified people are living longer with increasingly complex health needs

Envisioned more support for people with multiple health conditions, locally delivered multispeciality care, investment in primary care, and support for staff development

Laid the foundations for the FCP role

CSP Policy briefing paper supporting NHS Five Year Forward View FCP proposals

The General Practice Forward View

2016

Identified inconsistent systems and processes taking up too much GP time and resource

Envisioned practices and disciplines working together to release GP capacity

Envisioned expanding the non-medical workforce

Idea of piloting primary care physiotherapy services

Next steps on the Five Year Forward View

2017

Identified priorities of better health, better care and better value

Funding boost for primary care

The first phase of new care redesign was piloted through integrated ‘vanguard’ care models

CSP releases nation specific policy briefings

Service evaluations begin

Elective Care Transformation Programme

2018

The Elective Care Transformation Programme and CSP commissioned an evaluation report in 2018/19

CSP and HEE FCP implementation guidance released

HEE and NHSE Core Capabilities Framework released

Rapid roll out of services across England begins

NHS Long Term Plan

2019

Commitment to supporting increased numbers of physiotherapists working in PCNs

Included physiotherapists that patients can access directly without a referral from their GP - MSK FCPs

PHE 5 year framework pledged to embed three MSK FCPs in each STP by 2020

GP Contract

2019

Central government funding for PCNs to employ FCPs

Longer term service evaluations completed

Elective Care High Impact Interventions, FCP for MSK Services

National FCP Evaluation

2020 /21

Phase 1) A questionnaire collected data on the set up of the service

Phase 2) Standardised data collection templates installed on electronic health systems in pilot sites to collect data from FCP consultations

Phase 3) A national mixed-methods evaluation of FCP model against key success criteria

As well as streamlining pathways and reducing inappropriate referrals (Stynes, Goodwin and Bishop, 2020), a widely assumed benefit of the FCP model is a reduction in GP MSK workload (Chartered Society of Physiotherapy, 2018; Downie *et al.,* 2019, Halls *et al.,* 2020). However, it has not yet been confidently determined whether the FCP model can reduce GP workload (Goodwin *et al.,* 2020; Stynes, Goodwin and Bishop, 2020) and limited research into the role exists (Ingram, Stenner and May, 2023). What is clear however, is that by being a part of a multi-disciplinary primary care team, FCPs have the potential to be able to address wider patient, healthcare and societal issues such as vocational issues (Goodwin *et al.*, 2021; Saunders *et al.*, 2021) and public health initiatives, for example Making Every Contact Count (Ingram *et al.*, 2020).

In the only published economic evaluation of FCPs, Goodwin and Hendrick (2016) demonstrated considerable potential savings for the health economy, which included contributory factors such as improved prevention and self-management advice and the potential reduction of prescription costs. These findings were backed up by an MSK prevention framework published by Public Health England (Public Health England, 2019). Indeed, GPs support the need for FCPs to be able to prescribe (Morris *et al.*, 2021). Patients report being satisfied and supportive of the FCP service in primary care settings (Downie *et al.*, 2019; Stynes, Goodwin and Bishop, 2020; Morris *et al.*, 2021), however there is a cultural change needed to shift patient belief that GPs are not the only first point of contact for MSK conditions (Goodwin *et al.*, 2017). One way to address this confusion is to emphasize the role of receptionist staff to explain and signpost patients towards FCP care for MSK concerns (Moffatt, Goodwin and Hendrick, 2018; Goodwin *et al.*, 2021; Morris *et al.*, 2021; Wood *et al.*, 2021).

Advanced Practitioners in primary care and at first point of contact have been evaluated in other countries (Aranda and Jones, 2008; Dolovich *et al.*, 2008; Ludvigsson and Enthoven, 2012). Similar service evaluations have taken place more recently in England and have shown demand and support for the FCP model (Goodwin and Hendrick, 2016; Martini and Kelly, 2017; Moffatt, Goodwin and Hendrick, 2018; Downie *et al.*, 2019; Halls *et al.*, 2020), however with such a new role there is still limited evidence in the literature of the impact FCPs will have in the longer term and on the whole system (Halls *et al.*, 2020) and more time is needed to see significant shifts in culture (Goodwin *et al.*, 2020).

Significantly, NHS England supported 42 former Sustainability and Transformation Partnerships (STPs) (replaced in 2021 by Integrated Care Systems (ICS) across England following the 2019 NHS Long Term Plan) to pilot FCP services and take part in the National Evaluation of the First Contact Practitioner Model of Primary Care (Stynes, Goodwin and Bishop, 2020). The National FCP Evaluation had three phases:

- Phase One) A questionnaire collected data on the set up of the service, including funding, governance, staffing and care providers, led by NHS England.

- Phase Two) Standardised data collection templates installed on electronic health systems in pilot sites to collect data from FCP consultations over 10 months, led by NHS England.

- Phase Three) A national mixed-methods evaluation of FCP model, using surveys to determine patient reported experiences and outcomes of FCP (Stynes *et al.*, 2021) and focus groups and interviews to explore qualitatively the experiences of staff and patients (Goodwin *et al.*, 2021).

1.2.3 Challenges of First Contact Physiotherapy

Despite the many cited benefits of FCP, as a relatively new role in physiotherapy recent qualitative and quantitative work has identified challenges. Often based as a single FCP in a GP practice and splitting their working week between primary care FCP and roles in other physiotherapy services, the risk of professional isolation from peers is highlighted as a significant challenge (Greenhalgh, Selfe and Yeowell, 2020; Ingram, Stenner and May, 2023). As a result, FCPs may miss opportunities for peer support, mentorship and learning (Bearne, Gregory and Hurley, 2021, Baird *et al.,* 2022). Support networks, mentorship, regular clinical supervision, case review discussions and use of NHS approved messaging applications could offer a solution to this and encourage shared learning and increased resilience (Ingram *et al.*, 2020). The CSP now provides advice for FCPs on establishing peer networks to reduce isolation and make social and professional connections (Chartered Society of Physiotherapy, 2022a). The concern around professional fragmentation of physiotherapists based in primary care was raised in 2000, when in response to a postal survey carried out by Lowe and Bithell, 48.8% of managers stated that isolation urgently needed to be addressed. This concern has been echoed more recently by Greenhalgh, Selfe and Yeowell (2020), who found through a series of semi-structured interviews that most FCPs feel isolated because they are not part of the practice team.

FCPs face challenges in finding time for and accessing training and Continuing Professional Development (CPD) (Stynes, Goodwin and Bishop, 2020; Goodwin *et al.*, 2021), although the COVID-19 pandemic did limit data collection (Goodwin *et al.*, 2021). Furthermore, these challenges are made more difficult due to large variations in service provision, mentorship (Halls *et al.*, 2020) and advanced practice skills across the UK (Goodwin *et al.*, 2020; Halls *et al.*, 2020). Solutions have been put forward for these issues by Ingram *et al.*, (2020), who suggest long term workforce planning and brokering strong links with local universities to support local FCP development, which is aligned to the Health Education England (HEE) FCP roadmap. At NHS Agenda for Change (AfC) Band 7 as FCP or as ACPs at Band 8a, FCP practice must be: "underpinned by a master's level award or equivalent that encompasses the four pillars of clinical practice, leadership and management, education, and research" (Health Education England, 2017, p. 8). However, it is possible that the time pressures faced by FCPs in primary care (Langridge, 2019) may present challenges in fulfilling these four pillars and finding and using research evidence in clinical practice.

The implementation of the FCP role has raised potential challenges around maintaining staffing levels, as more physiotherapists moving into FCP roles could result in a loss of secondary care physiotherapists to primary care (Morris *et al.*, 2021). Furthermore, primary care practice managers and FCPs have reported concerns that there are not enough advanced level physiotherapists available to fill FCP roles, particularly in areas which are already facing high physiotherapy vacancy rates (Halls *et al.*, 2020). However, it is necessary to note the representativeness of this study is problematic and would have perhaps been more relevant if a wider range of populations had been sampled.

1.2.4 The evidence-to-practice gap

The delay between empirically generated research evidence from academia being taken up and used in clinical practice is referred to as the evidence-to-practice gap (Cooksey, 2006; Currie, Kiefer and Spyridonidis, 2020). It has been suggested that this gap results in patients not benefiting from healthcare advances and even being exposed to unnecessary risks of harm, as well as healthcare systems facing unnecessary costs (Grimshaw *et al.*, 2012). The delay between knowledge moving from academia to healthcare is often cited in the literature as being 17 years (Green *et al.*, 2009; Morris, Wooding and Grant, 2011; Hanney *et al.*, 2015; Munro and Savel, 2016). However, this has been shown to be inconsistent and affected by contextual factors (Morris, Wooding and Grant, 2011). What is clear however, is that delays in implementation of evidence into practice is in fact, too long and strategies are needed to accelerate translation of evidence into practice (Klaic *et al.*, 2022).

Additional to the delay in research knowledge being used in clinical practice, is the problem of research knowledge not being used at all. Research waste has resulted in huge sums of misspent money; in 2009, Chalmers and Glasziou estimated that 85% of $100bn a year spent on medical research globally was being wasted. Wasting research findings prevents effective patient treatment and undermines efforts to improve the effectiveness of health systems (Ivers and Grimshaw, 2016). Research waste is attributable to irrelevant research questions, inappropriate study designs, incorrect analysis methods and interpretations, and underreporting (Altman, 1994; Chalmers and Glasziou, 2009) as well as poor mobilisation of knowledge. For example, only one third of evidence informing guidelines are being used in practice (Mickan, Burls and Glasziou, 2011). Efforts have been made since 2009 to improve this, for example, the creation of the Reduce Research Waste and Reward Diligence (REWARD) Alliance which rewards funders and organisations for reducing avoidable waste in research (Ivers and Grimshaw, 2016). Support for adoption and spread of innovations across the NHS have also been reinforced in the 2014 Five Year Forward View (NHS England, 2014). However, changes in improving practice through increased and consistent use of research evidence have been slow (Glasziou and Chalmers, 2018).

1.2.5 Evidence-based medicine

Clinical practice and decision making is based on robust knowledge known as evidence-based medicine (EBM); the “conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients” (Sackett *et al.,* 1996, p71). EBM aims to integrate the best research evidence with clinical expertise, patient values and more recently, healthcare context (Thoma and Eaves, 2015), in order to overcome variations in practice. It is therefore important for both clinical practice and patient care. The EBM paradigm uses levels of evidence to demonstrate a hierarchy (See Figure 3: Evidence-based medicine levels of evidence pyramid) in which so called 'weaker' quality and higher volumes of study designs are depicted at the bottom (background information and expert opinion) and the so called 'stronger', but more infrequent study designs are at the top (systematic reviews and meta-analysis) (Murad *et al.*, 2016). Quantitative studies therefore tend to sit near to the top of the pyramid, whereas qualitative tend to sit near to the bottom.

In combination with patient and clinician knowledge, it was thought that the EBM approach would overcome variations in practice and reduce the evidence-to-practice gap and research waste, by encouraging more of the evidence from the top of the pyramid to be used in practice. However, despite having some successes the approach has been criticised, as wide variation still exists (Gabbay and le May, 2011; Greenhalgh *et al.*, 2014). It is not disputed that clinical practice should be based on the best available evidence, but that the 'gold standard' Randomised Controlled Trial (RCT) from the top of the pyramid no longer exerts a privileged dominant position (Contandriopoulos *et al.*, 2010; Gabbay and le May, 2011). This is because modern healthcare practice and the understanding of illness is complex, multifaceted and multi-contextual and a range of evidence from the top to the bottom of the pyramid - both quantitative and qualitative methods - need to be used to complement each other to navigate clinical decisions, rather than existing in isolation (Lakshman *et al.*, 2000; Gabbay and le May, 2011). For example, whilst controlled quantitative methods can generate statistical data which can be generalised for a large population, varying contexts (Flick, 2020) and the complexities of human behaviour (Lakshman *et al.*, 2000) cannot be sufficiently taken into account. This is because the impact and consequences of illness cannot be answered by quantitative research alone (Lakshman *et al.*, 2000).

Relying solely on quantitative, so called ‘stronger’ evidence from the top of the EBM hierarchy of evidence has therefore resulted in significant challenges to the uptake and use of evidence in practice (Gabbay and le May, 2011; Wieringa and Greenhalgh, 2015), potentially contributing to the challenges of the evidence-to-practice gap and research waste, because these types of studies cannot adequately explore the human complexities and changing contexts into which new innovations are being implemented. Current understanding shows that in fact knowledge does not move along an evidence pipeline directly from research into practice, as described by notable critics of EBM and the hierarchy of evidence Wieringa and Greenhalgh (2015). Their 2015 systematic review looked at 340 publications which mentioned ‘mindlines’ (See 3.5 Justification of theoretical lens used, for a detailed explanation and exploration of mindlines), and supported a more ontologically relativist approach to understanding multiple contexts, realities and knowledge types, arguing against knowledge as a simple collection of facts moving in a linear, rational way into practice providing “a single knowable reality … to strip away context to produce universal predictive rules” (Wieringa and Greenhalgh, 2015, p1).

The understanding that clinicians rarely follow explicit written guidelines and instead rely on their experiences, interactions with colleagues and other sources of (often tacit) knowledge is fundamental to the understanding of mindlines. For example, one study included in this systematic review was an ethnographic exploration of the influences on prescribing in general practice (Grant, Sullivan and Dowell, 2013). This study had a clear aim of understanding what influences GP prescribing in general practice, why they make the decisions they do and why they do not always use recognised research evidence. Multiple qualitative methods (non-participant observation with field notes, interviews and a review of practice documentation) were carried out and then triangulated for credibility to address this aim and allowed the researchers to understand in-depth the prescribing experiences of GPs. Observations of consenting patients and clinicians occurred in a variety of settings (for example, clinic consultations, home visits and practice meetings) and were approved by an ethics committee. Although the recruitment process on an individual level was not described in depth, recruitment on a practice level was - practices were ranked by their performance against Audit Scotland prescribing quality indicators and two high performing and one low performing practice were subsequently included. Although the authors acknowledge that data analysis was complex, they highlighted that patterns of prescribing behaviour were strongly evident from the data. They used participant quotes to support this data, which found that GPs rarely looked up explicit medication information and instead relied on their experiences, informal conversations and networks to update their prescribing mindlines. GPs in the higher prescribing quality practices make decisions on macro (collective, policy decisions) and micro (discussion with patients) levels, the combination of which resulted in them being more likely to implement higher quality evidence. They drew upon various sources to make prescribing decisions, including patient experiences, specialist knowledge, discussions with their practice pharmacist and colleagues, and the practice's prescribing policy. The qualitative data analysis for this study was robust in that it used double coding, constant comparison and memos, however the authors did not explicitly discuss their own reflexive thinking in terms of their role, potential bias and influence on the findings. The authors recognised that the study may have been limited in regards to the practices selected for participation differed in their structure and policies, for example one practice included in the study invested much more time and money in supporting practice based pharmacists than the others, which may have meant the GPs in that practice were much more likely to be able to draw upon the practice pharmacists' knowledge to enhance their prescribing mindlines.

Despite revealing relatively sparse literature on the important concept of mindlines, Wieringa and Greenhalgh's timely systematic review reinforces the crucial notion that knowledge is created, shared and validated through dynamic, human processes and cognitive shortcuts and cannot simply be copied and pasted from research (Levin, 2008; Gabbay and le May, 2011). Although it is to be noted that the review may have missed some descriptions of mindlines in the grey literature and institutional reports as it only included academic publications, it highlights the concept that knowledge is not a 'thing' that can be simply passed across from academia into practice in a linear fashion, mobilising a broad range of knowledge which also recognises and anticipates the highly contextual, human centred and practical implementation of evidence into practice is vital in reducing the evidence-to-practice gap and research waste.

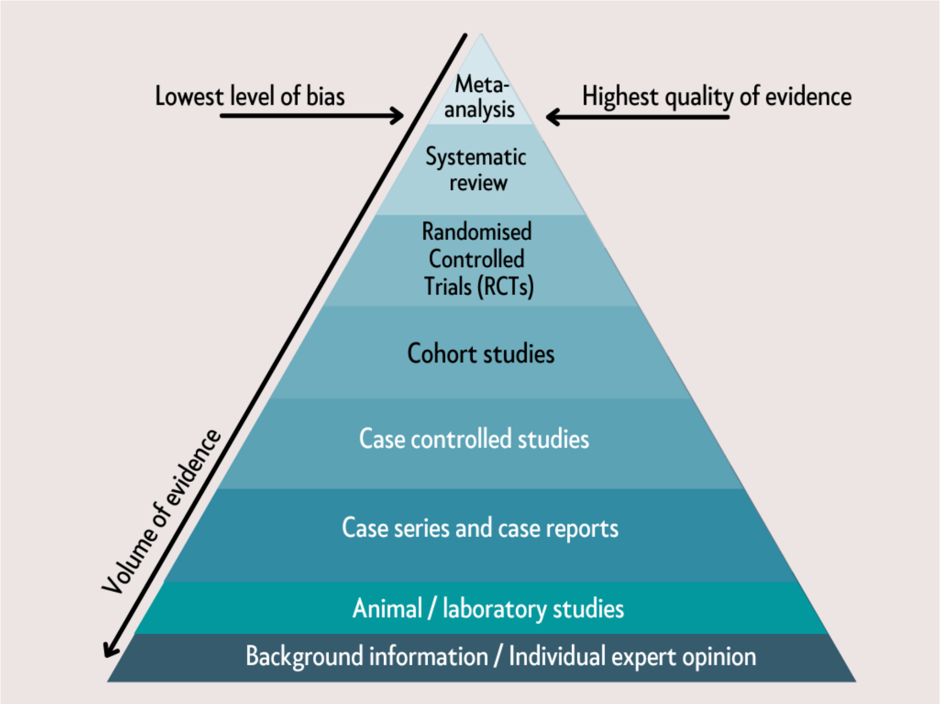


Figure 3: Evidence-based medicine levels of evidence pyramid

Source: Adapted from Duke University Medical Center Library and Archives (2019) and University of Miami (2022)

1.2.6 Knowledge mobilisation

Current thinking now centres around the need for different types and formats of knowledge to inform clinical decision making appropriate to different contexts; a need recognised by the field of KM. There are many related terms to KM and they are often used interchangeably (Khalil, 2016). For example, implementation science, which studies methods used to promote the use of knowledge and research findings into clinical practice (Eccles and Mittman, 2006) and dissemination, which relates to the active, linear movement of knowledge from the source to the knowledge user (Lomas, 1993).

As a co-created, complex and multi-directional social discipline, definitions for KM vary within the literature, as KM means different things to different people (Ward, 2017). Several definitions of KM have informed its conceptualisation within this thesis, where it is defined as moving knowledge to where it can be at its most useful (Ward, 2017), by actively creating, sharing and using different types of the best available knowledge (Powell, Davies and Nutley, 2017), within a given context, so that the right information gets to the right people, at the right time and in the right format (Levin, 2008). KM is a social process that involves two way relationships (Davies, Powell and Nutley, 2015), is complex and messy (Graham *et al.*, 2006), and considers stakeholder needs and drivers in order to transform the best available knowledge and evidence into practice.

1.2.7 Social media and the role of Twitter in healthcare, research and education

Social media

As knowledge sharing platforms, the social, professional and cultural prominence and scope of social media is continuously growing and evolving. Defined by Appel *et al.* (2020, p. 80) as "digital places where people conduct significant parts of their lives," social media are considered to be a form of Word of Mouth (WOM), which have permeated everyday life and social norms. An estimated 4.7 billion people - 59% of the world's population - used social media worldwide in 2022, out of 5.03 billion worldwide internet users (Kemp, 2022). Although Facebook remains the world's most widely used social media platform with 2936 million people accessing the site regularly (Kemp, 2022; Williamson, 2022), Twitter, which was founded in 2006, is currently used by 486 million people worldwide (Kemp, 2022) and is regarded as the best platform on which to expand and develop social networks with others (Chan and Leung, 2018). It is the fifth most popular social network globally (Williamson, 2022). Twitter began as a ‘microblogging’ site, on which users could post public messages up to 140 (now 280) characters long. These ‘tweets’ enable users to share news and updates and can also include images, web links, videos and polls. These can be commented on, liked or retweeted by other users worldwide.

Twitter spans geographical boarders, global structures and time zones, providing virtual links between people, places and organisations and offering rapid, easy access to vast amounts of information (Goff, Kullar and Newland, 2015; Pizzuti *et al.*, 2020). Much research has been carried out as to why people use social media such as Twitter, with three main reasons often cited; communicating and socialising with people that they know; communicating and socialising with people who they don’t know but who share common interests; and accessing and contributing to content (Appel *et al.*, 2020). However, this use of Twitter varies greatly; some people actively engage with others and post often, whilst others adopt a more passive behaviour, preferring to observe content and watch others engage, infrequently posting or not posting at all (Popovac and Fullwood, 2018). These individuals have been described as ‘lurkers’ – they are part of online communities but tend to observe, sharing little or no content and using information created by others rather than sharing information themselves (Popovac and Fullwood, 2018). Few studies have investigated exactly how people discover information on

Twitter, although Mohammadi *et al.* (2017) found that people tend to use their online networks to ask for and find the information they are looking for, rather than proactively searching for relevant posts, further reinforcing the ‘social’ aspect of social media.

Misinformation is a recognised downside to using Twitter. In a comparative analysis by Cinelli *et al.*, (2021), echo chambers were described as occurring when like-minded users favoured information close to their beliefs and tended to interact with similar networks, often ignoring contradictory or diverse information (also known as selective exposure, (Brugnoli *et al.*, 2019)). Information in echo chambers is reinforced when users favour information that confirms personal preferences (also known as confirmation bias (Brugnoli *et al.*, 2019)) and go on to repeatedly share biased information amongst like-minded people. Algorithms control newsfeeds and provide users with similar content and networks with which they have previously engaged (Cinelli *et al.,* 2021). This has the potential danger of accentuating echo chambers and bias and creating extreme polarised positions, contributing to the spread of misinformation and fake news (Cinelli *et al.,* 2021). Furthermore, it is estimated that up to 15% of active Twitter accounts are social media bots (Varol *et al.*, 2017); these are software applications which use artificial intelligence, analytics and databases to imitate the online behaviour of human Twitter users. Only around half of users who have heard of bots feel confident in recognising one (Stocking and Sumida, 2018).

Twitter in healthcare

Twitter is the most popular social media platform for healthcare communication (Pershad *et al.*, 2018; Markham, Gentile and Graham, 2020), which takes place for example via public tweets, direct messages, Twitter journal clubs, tweet chats and conference tweet ups (Markham, Gentile and Graham, 2020). Searchable hashtags (#) link up HCPs with similar interests (Pizzuti *et al.*, 2020), categorise information and move knowledge beyond the traditional closed doors of conferences (Allen *et al.*, 2018). All 33 papers included in a 2018 systematic review by Chan and Leung stated that social networks, including Twitter, enhanced both communication and sharing of knowledge, although the reviewed papers in this study varied in their definitions of personal versus professional use of social media, leading to potential ambiguity. However, there is limited guidance for HCPs on how to use Twitter. Advice in the literature concerns online professionalism and effective audience engagement (Kind, Patel and Lie, 2013; Grajales *et al.*, 2014), incorporation of Twitter into a daily clinical routine (Goff, Kullar and Newland, 2015) and inclusion of social media in medical school curriculums (Pershad *et al.*, 2018). Although much of the literature focusses on the use of Twitter by HCPs and clinicians rather than physiotherapists specifically, an editorial by Hebron (2018) has discussed how Twitter can offer physiotherapists access to community, CPD, research impact, health promotion and collaboration with others. Additionally, the content and reach of physiotherapy Twitter networks have been explored by Sabus *et al.* (2019) in a 12 week observational study, where analysis of over 30,000 physiotherapy related tweets found that the most common intended audience of tweets was between professionals (35.5%). Twitter as an electronic information resource used by physiotherapists for CPD has been described by Clode *et al*. (2021).

Twitter offers a platform on which to engage with patients. In their timely content analysis of Twitter sentiment around arthritis and COVID-19, Berkovic *et al.*, (2020) found that by using social media to observe patient narratives, HCPs can better understand the concerns of patients with arthritis and in turn provide better person-centred care. Having a website is no longer enough, and proactive, interactive methods of engagement are considered vital to stimulate engagement with diverse audiences, including patients. There is now data to say that engaging with patients on social networks in organized events such as tweet chats may lead to improvements in some health related outcomes (Markham, Gentile and Graham, 2020) and even improve quality of care (Pershad *et al.*, 2018). Furthermore, social media can support HCPs to reach ethnic minority and lower socioeconomic group communities (Surani *et al.*, 2017).

Twitter in physiotherapy education

Twitter has also been considered as a tool for learning and engaging with others in the field of physiotherapy undergraduate education. In their mixed methods study exploring how third year physiotherapy students felt about a dedicated Twitter feed for learning resources, Deaves, Trainor and Grant (2017) found that the majority of students thought that it enhanced their learning and access to information, with their use of the platform increasing during the study. However, several barriers were also noted, with participants describing Twitter as a distraction and reporting not feeling confident enough to engage with others online. This lack of confidence to use the platform has been further echoed by Lowe *et al.* (2017), who determined that although first year undergraduate students thought Twitter was useful for boosting career prospects, students did not think they had the credibility to post on Twitter, compared to what the authors called the 'Academic and Professional Twitterati.' Students instead adopted a subordinate role to these 'celebrity-like' physiotherapists, who they considered to be more knowledgeable. Furthermore, 72% of those surveyed in the study reported never using Twitter for learning. Lecturers are therefore encouraged to consider how best to use Twitter in undergraduate physiotherapy education (Deaves, Trainor and Grant, 2017), for example through signposting students to relevant and interesting hashtags and profiles, using learning-friendly types of tweets and using Twitter during lectures (Lowe *et al.,* 2017). Furthermore, lecturers can encourage undergraduate students to use social media as a learning tool to link with clinical and research experts and fellow students to share resources (Depala and Greene, 2016).

Twitter in research

In academia, there is now recognition that tweet counts can be used as impact evidence for reaching various audiences, as academics more frequently leverage their online networks to share and acquire real time knowledge (Mohammadi *et al.*, 2017). 'Tweetations' now exist alongside regular citations on some journal websites, for example the Journal of Medical Internet Research (JMIR). This can be further illustrated by the development and popularity of Altmetric, a website which tracks a range of social web sources, including Twitter, to capture academic related indicators of online conversation around scholarly work (Altmetric, 2021). Tracking non-academic online sources provides additional impact data that traditional citation based indicators do not take into account and are often too slow to accumulate (Mohammadi *et al.*, 2017). Although Twitter is still used by a minority of academics, who are mainly from a humanities or social science background (Mohammadi *et al.*, 2017), there is evidence to show that Twitter is fast becoming a new platform to increase academic reputation by sharing publications. 10% of 1.4 million publications indexed in both PubMed and Web of Science between 2010 and 2012 were also tweeted (Mohammadi *et al.*, 2017). More and more traditional academic journals now have a strong presence on Twitter (Markham, Gentile and Graham, 2020), indicating the recognition of the platform as a way of reaching out to broaden audiences.

1.3 The research question, aim and objectives

The previous sections have introduced the key concepts relevant to this MPhil study. The literature is clear regarding the current global burden of MSK conditions on individuals, society and healthcare systems. Recent qualitative and quantitative work around FCPs has also shown that FCPs face their own unique professional challenges when treating MSK conditions; increased patient demand; isolated working (Greenhalgh, Selfe and Yeowell, 2020), and less time for CPD (Stynes, Goodwin and Bishop, 2020; Goodwin *et al.*, 2021). Twitter was chosen as the most appropriate social media platform to explore knowledge sharing in this study for two key reasons; firstly, it is open to all, and secondly, it offers diverse forms of bite-sized knowledge for FCPs. Although Facebook, Youtube, Whatsapp, Instagram and TikTok are the world's most-used social platforms (Kemp, 2022), as an open and diverse public arena, the Stakeholder Advisory Group (SAG) in this study agreed that Twitter offers HCPs additional insight and understanding into patient narratives and patient knowledge which can improve care (Berkovic *et al.,* 2020). These narratives are, for example, often hidden within private patient support groups on platforms such as Facebook and would not be as present on professional-to-professional social media sites such as LinkedIn. Additionally, there has been a rise in HCPs often using Twitter for professional purposes (Pershad *et al.,* 2018). Furthermore, the more concise length of tweets allows users to rapidly share and access a high volume of succinct knowledge and Twitter provides links to knowledge in various formats, for example images, text, videos and links. This contrasts with YouTube and TikTok for example, which concentrate solely on videos, and Instagram, which centres around image sharing. Marketing literature consistently states that despite recognised concerns, Twitter opens up opportunities for social and professional networking and provides rapid, easy access to knowledge acquisition and knowledge sharing. Yet, despite the support in the literature for social media use amongst HCPs, no literature was found focusing specifically on the role that Twitter plays in clinical practice and learning amongst FCPs. Furthermore, Elliott *et al.* (2020) acknowledge that there is a knowledge gap in whether or not social media helps users to share, mobilise and co-create knowledge.

The literature does not show if FCPs use Twitter to access, exchange and use knowledge to inform clinical practice, or if and how Twitter could potentially address the challenges faced by FCPs. With no publications existing to examine the attitudes, beliefs and behaviours of FCPs around using Twitter, there is a significant gap in the evidence in regards to FCPs using Twitter to access current evidence, develop best practice and network with peers. Furthermore, whilst guidance does exist around Twitter use for physiotherapists (Chartered Society of Physiotherapy, 2019), there is no known specific guidance for FCPs, who have different contexts, demands and working environments to other physiotherapists. Twitter for KM in FCP practice has not yet been explored.

Therefore, this thesis has the overarching aim to develop new insight around if, how and why Twitter can be used to mobilise knowledge to inform FCP clinical practice. The overarching research question for this thesis is:

What are the attitudes, beliefs and behaviours of MSK FCPs about using Twitter as a source of knowledge to inform clinical practice?

This thesis will demonstrate how the research question was answered through the completion of four key objectives:

1. To explore the perceptions and experiences of FCPs about how knowledge accessed via Twitter is used in clinical practice
2. To understand how Twitter may (or may not) be used by FCPs to access knowledge for clinical practice and the factors that influence its use
3. To determine what type of tweet format best communicates knowledge to FCPs
4. To provide Knowledge Mobilisers with deeper insight and understanding on effective translation of research to FCP practice via Twitter

It is important to outline the definitions that will be used throughout this thesis when considering attitudes, beliefs and behaviours. Attitudes, beliefs and behaviours can be self-identified or objectively observed (Bruvold, 1972) and are formed early in clinical education, potentially predicting and influencing future attitudes, beliefs, and behaviours as HCPs (Ghandora *et al.*, 2019). However definitions in the literature are complex, multifaceted and widely debated (Tesser and Shaffer, 1990) with significant overlap and connection between them. Attitudes, beliefs and behaviours are believed to be linked through the principle of consistency (van Kampen, 2019); meaning that a person's behaviour is mostly consistent with the attitudes and beliefs that they hold. In this thesis the attitudes, beliefs and behaviours of FCPs will be described together and the following definitions used.

Attitudes are defined in this thesis as ”settled ways of thinking and feelings towards significant objects, groups, events or symbols" (Cottrell *et al.*, 2017; Hogg and Vaughan, 2018; Biddle *et al.*, 2021). Beliefs are described as “pre-existing views about how the world is” (Cottrell *et al.*, 2017; Biddle *et al.*, 2021; Spaulding, 2021) and behaviours are ”observable ways in which one acts or conducts oneself” (Bruvold, 1972; Cottrell *et al.*, 2017).

1.4 Chapter summary

This chapter has introduced the context to the development of this research opportunity and described the structure of the thesis. It then went on to explore and describe current literature around the key concepts informing this thesis, before moving on to outline the research question, aims and objectives. The next chapter will explore the concept of knowledge and the field of KM, in which this study sits.

Chapter Two: Knowledge and knowledge mobilisation

2.1 Introduction

This chapter firstly explores the conceptualisation of knowledge, types of knowledge and the relationship between data, information, knowledge and wisdom. This is followed by an overview of KM approaches and challenges, before the role of theory in KM is described and an overview of Twitter in regards to KM is given.

2.2 What is knowledge?

Defined as a justified, true belief (Nonaka and Georg von Krogh, 2009), knowledge is a multifaceted, complex and evolving concept that has been much debated (Rowley, 2007), with the extensive challenge of defining, theorising and understanding the concept investigated through an entire field of philosophy called Epistemology.

In healthcare, traditional explanations which describe knowledge as a product that can be directly transferred to people and places in a linear fashion (Guyatt *et al.*, 1992) have been frequently contested by scholars such as Greenhalgh (2010), who echoes the business organisation literature and discusses knowledge instead as varied, social and influenced by context. Current thinking therefore proposes that knowledge is not a singular construct and different types of knowledge are gleaned from numerous sources, to be used in combination for different purposes, in different ways, by different people (Ward, 2017). For example, knowledge can be used directly (simple clinical decision making from direct research findings), indirectly (context sense making over years of experience) or persuasively (tactically using knowledge to justify decisions), and the impact that knowledge has can be rapid or can take time (Levin, 2008).

2.2.1 Types of knowledge

There are several types of knowledge which are used for a variety of reasons in a range of contexts. First, knowledge can be explicit or tacit. Explicit knowledge can be seen in policies, statements or guidelines and includes facts and rules which can be articulated to others and shared without the need for further discussion (Wyatt, 2001). This type of knowledge has been referred to as codified, or formal knowledge (Gabbay and le May, 2011). Empirical knowledge in the form of research evidence is considered explicit knowledge, which is knowledge gathered objectively through traditional, structured and academic approaches, for example through observational studies, RCTs or meta-analyses of data from multiple RCTs.

On the contrary, tacit knowledge encompasses knowledge that cannot be measured, demonstrated or explained, is tied to rules of thumb, context and intuition (Nonaka and von Krogh, 2009) and is often a shared understanding held by individuals or groups. It has been referred to as informal, practical and practised (Gabbay and le May, 2011). Experiential knowledge has been described as a type of tacit knowledge (Kothari *et al.*, 2012) and can be at the level of individuals, teams, and organisations. This type of knowledge is developed through practical, lived experiences and in terms of healthcare, can also constitute professional expertise or patient journeys. Furthermore, knowledge can be gathered through conversations and debates with others to produce different opinions, decisions or ideas.

Crucially, although they are different, explicit and tacit knowledge types are mutually complimentary, particularly in the field of KM, and the two often interact along a continuum (Nonaka and Georg von Krogh, 2009). For example, while policy can guide practitioner decisions, this explicit form of knowledge is not typically used in isolation in clinical practice (Gabbay and le May, 2011). Instead, it requires a tacit foundation (Kothari *et al.*, 2012) which interacts and influences if, how and why the policies are used in practice and therefore needs to be combined with other types of knowledge, for example past experience, in order for it to be purposefully used (Contandriopoulos *et al.*, 2010; Gabbay and le May, 2011). Making knowledge work in the real world of clinical practice for individual patients and in differing service level operations therefore requires a combination of different types of knowledge (Bowen and Graham, 2013; Wieringa and Greenhalgh, 2015). It has been argued that HCPs will not always change their behaviour because the evidence tells them to (Levin, 2008). Therefore, knowledge needs to be considered in relation to local contexts, as it is continuously created, shaped and shared by people constantly coming into contact with other people, events and ideas over time (Gabbay and le May, 2011; Williams, 2014).

The challenge is to understand these local contexts, and the influential tacit knowledge which may exist within them, for explicit knowledge to be adapted effectively and used in practice. The nature of tacit knowledge means it can also act as a barrier to implementation; it is deeply embedded within teams and routines and it is highly practice and context related (Kothari *et al.*, 2012) and therefore difficult for others outside of these teams to understand. Furthermore, deeply entrenched tacit knowledge may even be a barrier to using new explicit knowledge in practice if it conflicts with individual or collective drivers and priorities (Contandriopoulos *et al.*, 2010; Kothari *et al.*, 2012).

2.2.2 Data, information, knowledge and wisdom

The Data-Information-Knowledge-Wisdom (DIKW) Hierarchy (Ackoff, 1989) is widely recognised across disciplines in the information science and knowledge management literature as a way of explaining the complex, variable interaction and associations between the concepts of data, information, knowledge and wisdom (Rowley, 2007) (See Figure 4: Data-Information-Knowledge-Wisdom Hierarchy). Broadly speaking the DIKW hierarchy proposes that; “data can be used to create information; information can be used to create knowledge, and knowledge can be used to create wisdom” (Rowley, 2007, p164).

According to the DIKW hierarchy, *Data* (for example numbers, symbols, words) generally have no meaning when on their own and must be combined and given meaning to generate *information* (for example dates, signs, sentences) (Grove, 2017). Information can be viewed as the representation of an action, object or concept through facts, records and evidence (Williams, 2014). When information is then combined with existing contextual understanding and applied and used more fluidly, it becomes *knowledge*. For example, research evidence can be considered information when it enters the clinical world and becomes knowledge when health care HCPs have shaped and moulded it to fit with their context, experience, skills, ideas, and drivers (Gabbay and le May, 2011), and when they interact with other people, ideas, experiences and contexts (Williams, 2014). Knowledge then becomes *wisdom* when our beliefs and judgements are intertwined with it (Ackoff, 1989; Rowley, 2007). The DIKW hierarchy therefore offers a rationalist explanation of terminology which is helpful when considering how knowledge is created and where it sits contextually. Nevertheless, it is important to note that knowledge, wisdom, information and data are in fact in a constant state of flux and development and dependent on many different contexts, time periods, interactions and experiences (Gabbay and le May, 2011; Kislov, Hodgson and Boaden, 2015) and this linear, simplistic description fails to represent the fluidity of knowledge creation and its multiple external influences (Williams, 2014).

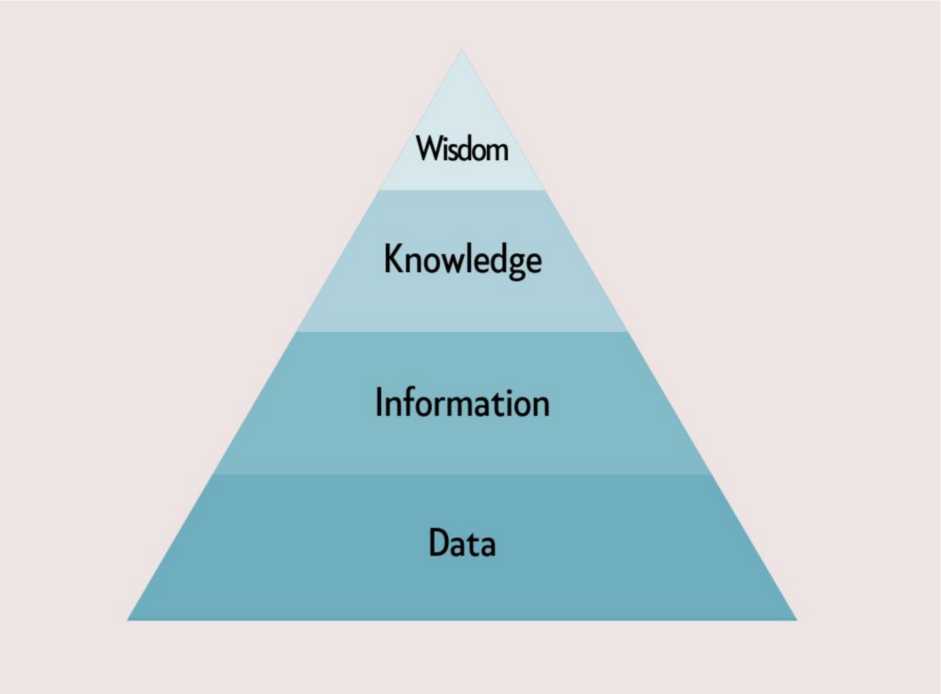


Figure 4: Data-Information-Knowledge-Wisdom Hierarchy

Source: Adapted from (Rowley, 2007, p. 164)

2.3 Knowledge mobilisation approaches

KM is about moving knowledge to where it can be at its most useful (Ward, 2017) and a more detailed description of the discipline can be found in Section 1.2.6: Knowledge mobilisation. Successful approaches to KM must be relational, contextual and overcome silos by bringing together different stakeholders and types of knowledge to support and accelerate translation of evidence into practice (Klaic *et al*., 2022). These approaches must be combined with working with evidence which is relevant, robust and ready to be implemented and any methods of change need to be well managed and facilitated. Yet there is a lack of practical guidance or robust evidence in this area (Davies, Powell and Nutley, 2015) and a combination of KM approaches can be used together. Approaches can involve knowledge being 'pushed' out to knowledge users (for example, disseminating research findings at a conference or publishing a paper) by knowledge producers (for example, researchers) usually at the end of the research process (Rushmer *et al.*, 2019). Knowledge can also be 'pulled' by knowledge users (for example, HCPs or policy makers) into decision making for practice (for example, HCPs looking for ways to improve services by consulting with stakeholders or policy makers commissioning or gathering research to answer a policy problem) (Jacobson, Butterill and Goering, 2003; Rushmer *et al.*, 2019). Additionally, 'linkage' and 'exchange' approaches aim to increase the relevance and accelerate the use of evidence in practice, by creating meaningful relationships between stakeholders and communities to collaboratively produce and address questions relevant to clinical practice (Lomas, 2000, Davies *et al*., 2015), recognising context, drivers and motivators. The following sections will outline

KM approaches that centre around linkage and exchange and describe key people who can optimise KM processes to facilitate the push and pull of knowledge and ensure that the right information gets to the right people at the right time.

2.3.1 Stakeholder engagement

Engaging stakeholders in research has been acknowledged as an important way of closing the evidence-to-practice gap and achieving impact (Boaz *et al.*, 2018), enabling an understanding of stakeholder contexts, drivers, tensions and motivators concerning the push and pull of knowledge between academia and clinical practice. KM is at its heart a social process (Davies, Powell and Nutley, 2015) and sustained engagement over time is vital in understanding the human emotional factors that accompany change and innovation (Levin, 2008).

Ultimately, research and practice should not be seen as separate activities, and KM is a partnership between stakeholders linking the production and application of evidence (Holmes *et al*., 2017). However, it is clear that there is ‘no one size fits all’ approach (Grindell *et al.*, 2022) for stakeholder engagement, and co-production methods are often used in KM to support a person-centred, contextual and more relevant understanding of specific KM challenges, in contrast to the traditional linear pipeline accounts of knowledge into practice (Knowles *et al.*, 2021). Co-production, also described as co-creation and co-design, is “the collaborative generation of knowledge by academics alongside stakeholders from other sectors” (Greenhalgh *et al.*, 2016, p 393), and includes patients and the public, policy makers, clinicians and management.

An important stakeholder group not to be overlooked are patients and the public. PPIE is now common practice in health and care research and the active involvement of people with experience of living with health conditions in every stage of research is a requirement by grant funders (Russell, Fudge and Greenhalgh, 2020), in order to ensure research findings have impact and research waste is lessened (Greenhalgh *et al.*, 2016; Locock and Boaz, 2019). Patients and the public can share their 'expertise by experience' of living with MSK and other health conditions (Jinks *et al.*, 2016). However, evidence about PPIE impact is still considered anecdotal and weak (Brett *et al.*, 2014; Russell, Fudge and Greenhalgh, 2020), particularly within implementation (Burton and Rycroft-Malone, 2015) and KM research and practice. This is despite arguments that working collaboratively with patients and the public has the potential to enhance the impact of research into in healthcare (Burton and Rycroft-Malone, 2015), by providing context and informing strategies needed for successful implementation (Staniszewska, Thomas and Seers, 2013). Furthermore, PPIE is still notoriously carried out as consultation type roles and mere tick box exercises rather than a true co-produced approach to successful KM, despite emerging literature that demonstrates that co-production provides opportunities for the creation of the hybrid knowledge which is vital to successful KM (Knowles *et al.*, 2021).

2.3.2 Communities of Practice

One approach to engage stakeholders is through a Community of Practice (CoP). CoPs are defined as “a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger, McDerott and Snyder, 2002, p. 4). Derived from business organisational research, CoPs are an important approach in KM because they offer a way of combining knowledge types and understanding contextual differences, allowing stakeholders to make sense of explicit knowledge through discussion and learning (Wieringa and Greenhalgh, 2015). CoPs enable an understanding of the perspectives of all stakeholders, subsequently enabling a deeper understanding of their different contexts, tensions, drivers and motivators to facilitate more successful outcomes of KM activities. CoPs are becoming increasingly common in healthcare as a way for interdisciplinary groups of people to deepen their knowledge and expertise in a particular topic, through ongoing interaction (Wenger, McDerott and Snyder, 2002; Shaw *et al.*, 2021). Furthermore, CoPs provide a forum for supporting implementation of evidence-based practice more broadly (Linkewich *et al.*, 2022) and building relationships for knowledge sharing and KM (Shaw *et al.*, 2021), by supporting interaction and knowledge sharing between experts and novices and promoting a sense of belonging (Li *et al.*, 2009).

In virtual CoPs, members interact using common online environments such as social media. They have grown in popularity since the COVID-19 pandemic and are becoming more widely recognised. Examples of multidisciplinary virtual CoPs can be seen in many different areas, for example; in supporting the implementation of stroke best practice (Linkewich *et al.*, 2022), policy and practice improvement groups (Sibbald *et al.*, 2022) and healthcare simulation education in emergency medicine (Thoma *et al.*, 2018).

2.3.3 Boundary spanning roles

One way of linking multidisciplinary stakeholders, increasing knowledge exchange and understanding the contextual needs of different organisations is through boundary spanning roles. These are people with split roles in more than one organization, who can provide deeper understanding of the barriers and enablers to change and give insight into different types of knowledge (Swaithes, Walsh and Quicke, 2021), for example, clinical-academic roles. Boundary spanners have a good understanding of both of the worlds that they are a part of and therefore the contexts, tensions, drivers and motivators relevant to those worlds, offering unique insight and therefore facilitating more successful outcomes of KM activities. Stakeholders are more likely to adopt evidence that fits their unique agendas, conforms to their expectations and matches their values and drivers (Jacobson, Butterill and Goering, 2003). Boundary spanning roles offer a unique opportunity to share knowledge, skills, and ideas across networks (Swaithes *et al.*, 2019) in order to achieve a deeper understanding of these. Boundary spanners 'belong' to multiple groups. As they move knowledge between them, they effectively become 'bi-lingual,' communicating evidence and innovations by bridging network gaps and professional silos (Cranley *et al.*, 2019) and proactively reaching out to collaborate with others (Hoffmann-Longtin *et al.*, 2020). However, the role does face challenges. Significantly, boundary spanners must maintain an identity in two or more disciplines and as such develop a tacit understanding of these communities, and navigate tensions such as being seen as an outsider, imposter syndrome, and some knowledge gaps (Hoffmann-Longtin *et al.*, 2020).

2.3.4 Knowledge brokering

Acting as the 'human component' of KM, Knowledge Brokers are professionals who work towards building two-way social relationships with stakeholders in order to better understand each other's goals and professional cultures, enhancing the chance of successful mobilisation of knowledge and implementation of evidence (Bornbaum *et al.*, 2015). Although they share the same remit around linking stakeholders to exchange knowledge, they differ from boundary spanning roles in that they are usually externally facing and span groups to which they do not belong, linking groups or individuals that have no relation to each other (Haas, 2015) but are similar in regards to their understanding of the language, contexts, tensions, drivers and motivators used by different stakeholder groups, therefore facilitating more successful outcomes of KM activities.

Knowledge Brokers must find, combine, adapt and share different types of appropriate knowledge for successful, context specific and evidence-based KM (Ward, 2017). Whilst working with empirical, explicit knowledge is vital, interpreting stakeholder experiences, facilitating discourse and understanding the presence of tacit knowledge sharing in the stakeholder groups with which they are trying to engage is vital for effective knowledge brokering. This is gleaned during social interactions rather than from more explicit or empirical sources such as publications or guidelines (Cranley *et al.*, 2019). This has resulted in national organisations such as Collaborations for Leadership in Applied Health Research and Care (CLAHRCs), now known as Applied Research Collaborations (ARCs), advocating for Knowledge Brokers to use frequent personal interactions to bridge the evidence-to-practice gap and achieve change (Soper *et al.*, 2013).

However, knowledge brokering faces multiple challenges. Knowledge Brokers need to have legitimacy and credibility to engage effectively with stakeholders, however historical hierarchies, lack of power, entrenched tacit ways of thinking and perceived status may block knowledge brokering within large, complex health and care groups (Currie *et al.*, 2014; Bayley *et al.*, 2018). Further to this, Knowledge Brokers working on their own in these large systems are unlikely to have a high impact at a system level and it has been suggested that isolated knowledge brokering roles is not enough, and a collective, multi-professional approach to brokering in an organization is needed instead (Kislov, Wilson and Boaden, 2017).

2.4 Challenges to mobilising knowledge

Achieving successful mobilisation, uptake and use of knowledge in healthcare settings involves challenges which must be taken into account in KM approaches (Grimshaw *et al.*, 2012). Firstly, academic environments and clinical practice have different contexts, cultures, drivers, demands and goals which do not necessarily align or understand each other – researchers demand rigour and reliability, which can take time, whereas NHS managers need immediate answers and clear plans for service innovation (Lamont *et al.*, 2016). Efforts to improve interaction and understanding between research and practice are becoming more common through the growing conceptual and theoretical understanding of KM. Moreover, these efforts can be applied to the contextual differences between different clinical environments, such as understanding the drivers, priorities and challenges of more generalist primary care settings and how they interact with the more specialist secondary care settings. KM recognises therefore that implementation of evidence into practice can never take a ‘one size fits all’ approach.

Secondly, healthcare contexts can change extremely quickly. An example of rapid changes to healthcare context is illustrated by Swaithes, Dziedzic, Sharp, *et al.*, (2020), who explain how the COVID-19 pandemic necessitated the rapid and efficient reordering of services and pathways and the need for multiple stakeholders’ healthcare drivers and implementation funding to subsequently align, for example to support and develop the use of virtual healthcare services. Admittedly, this is a rare occasion and there is infrequently absolute collective alignment and funds to support implementation. In fact, according to a report by the Nuffield Trust, one of the reasons why rapid implementation of innovations into the NHS often ‘falls short’ is that the research process does not assess real-world innovations in a timely way (Castle-Clarke, Edwards and Buckingham, 2017).

Finally, the often complex, fragmented make up of healthcare systems facing numerous competing drivers and priorities, such as culture, staffing and funding is a challenge for KM. Increased demand on services, understaffing, and lack of joined up care can be barriers to innovation in the healthcare context (NHS England, 2019). Organisational cultures are entrenched in historical ways of working making changes to ways of working challenging, which further emphasizes the importance of stakeholder engagement. Yet job roles are often in flux, there are insufficient connections across disciplines and stakeholder networks change quickly, resulting in difficulties with sustaining relationships (Jacobson, Butterill and Goering, 2003). Furthermore, funding, infrastructure and resources required to change practice are sparse (Lau *et al.*, 2016), particularly as effective KM takes time (Levin, 2008).

2.5 Theory in knowledge mobilisation

Theory can help us to understand how things work (or don't work) and why. Theoretical approaches strengthen the design and implementation of best practice and research in healthcare, increasing the likelihood that knowledge is used in practice. For KM, theories, models and frameworks can be used to understand why and how knowledge is being mobilised, whose knowledge it is and what type of knowledge it is (Ward, 2017). However the vast array of theories, models and frameworks for KM and implementation can be challenging for clinical and commissioning contexts (Levin, 2008) and there is still significant overlap which can make it difficult for stakeholders to choose relevant and successful approaches (Lau *et al.*, 2016). Confusion between their differences and uses can lead to concepts being used interchangeably (Nilsen, 2015; Ward, 2017). Furthermore, few of the vast amount of theories, models and frameworks associated with KM and implementation have been empirically tested to improve their quality (Levin, 2008; Davies, Powell and Nutley, 2015) and many are seen as overly complex and hard to operationalise in practice (Davies, Powell and Nutley, 2015).

In 2015, theories, models and frameworks in KM were summarised in a paper by Davies, Powell and Nutley (2015), at the same time theories, models and frameworks in implementation science were summarised in a paper by Per Nilsen (2015). There was much overlap between the two. For example the Knowledge to Action (KTA) cycle (Graham *et al.*, 2006), Normalisation Process Theory (NPT) (May and Finch, 2009) and mindlines (Gabbay and le May, 2004) were recognised in both pieces of literature thus demonstrating the overlap in thinking and approaches.

Current thinking around KM theory has moved away from traditional, linear processes and now centres around the importance and complexity of context and relationships; the ‘how’ of KM is particularly well discussed in the literature and looks at connecting stakeholders and brokering relationships, disseminating knowledge and facilitating learning and co-production (Ward, 2017). Some existing KM and implementation theories, models and frameworks address KM and implementation at an individual level (for example, behaviour change theories), some at a group or organisational level (for example Absorptive Capacity, which aims to explain how healthcare organisations “acquire, assimilate, transform and exploit knowledge to produce a dynamic organisational capability” (Zahra and George, 2002, p. 186)), and some look at how a new model of care may be adopted in clinical practice (for example, NPT). Some aim to help Knowledge Mobilisers better understand and influence change in practice settings by outlining how knowledge creation and implementation are linked (for example, the KTA cycle (Graham *et al.*, 2006)), and the ways that context may impact success (for example, the i-PARIHS Framework (Integrated Promoting Action on

Research Implementation in Health Services) (Harvey and Kitson, 2016). Others are aimed at understanding collaborative knowledge exchange and decision making in the complexities of real world practice (for example, mindlines (Gabbay and le May, 2004)), and some provide a framework for understanding how to “help [WHO] to mobilise [WHAT] by [HOW] in order to [WHY]” (Ward, 2017, p488).

2.6 Twitter and knowledge mobilisation

There are examples in the literature of Twitter being used as a space to conduct health research (Arigo *et al.*, 2018), to disseminate scientific messages through hashtags at conferences (Allen *et al.*, 2018) and to promote conversation via online journal clubs (Markham, Gentile and Graham, 2020), there is however a dearth of evidence for it being used proactively as a two-way platform for mobilising healthcare knowledge. As breaking news often appears on Twitter and spreads widely before it is published in traditional media outlets such as newspapers or on television (Markham, Gentile and Graham, 2020) it has been shown to be an influential public tool in times of crisis for rapid knowledge sharing (Tonkin, Pfeiffer and Tourte, 2012; Truong *et al.*, 2014). However, the usefulness of Twitter is not just limited to emergency situations, the evolution of the platform has altered the way in which knowledge is shared day to day between users (Brugnoli *et al.*, 2019). Yet despite Twitter’s global prominence, potential to connect and mobilise healthcare knowledge, there has only recently been emerging evidence which shows that social media could support professional development and knowledge use by health care providers (McLoughlin *et al.*, 2018; Zhao *et al.*, 2022)

Twitter has the potential to increase conversations amongst FCPs regarding the MSK evidence base and can be used to enact strategies to reduce the evidence-to-practice gap. In their 2018 study looking at Twitter as a tool to increase research reach on sexual violence, Wekerle *et al.*, stated that “If the goal of research is impact, the impact circle needs to broaden from the research community” (p221). This sentiment is further reinforced by Elliott *et al.*, (2020), who recommend a social media strategy be embedded in KM activities from the beginning of research, yet there are no current theories, models or frameworks in KM that offer advice for successful social media strategies in KM and no current social media theories that fit with the complexities and contexts of KM strategies. Moreover, Twitter offers a platform for moving academic knowledge out of richer, urban capitals where traditional academic circles are currently centred (Struminger *et al.*, 2017) and out into more diverse communities such as smaller, rural primary care centres. Importantly, Twitter has the potential to be just one tool of many for Knowledge Mobilisers to use to move away from the traditional, linear dissemination of information by supporting conversation, collaboration and engagement (Phipps, Jensen and Myers, 2012).

2.7 Chapter summary

This chapter began by discussing the key concept of knowledge, examining its different types and how it is created and situated within related concepts of data, information and wisdom. This was followed by an exploration of relevant practical approaches to KM and challenges to mobilising knowledge. The chapter then described the importance of theory in KM, before discussing the relationship between Twitter and KM. The following chapter will give an account of the research methods chosen to answer the research question and the theoretical lens used.

Chapter Three: Research methods

3.1 Introduction

This chapter starts by outlining the underpinning philosophy of this research and the methodological considerations for data collection in the context of the COVID-19 pandemic, before providing the justification for the final research methods chosen and for using mindlines as a theoretical lens in which to interpret the data. It then goes on to describe the rationale for engaging with stakeholders, including patients and the public, before going on to explain in detail the sampling and recruitment methods used, data collection and data analysis.

3.2 Methodological considerations

The overarching aim of this thesis was to develop new insight around if, how and why Twitter can be used to mobilise knowledge to inform FCP clinical practice, through the exploration of MSK FCP attitudes, beliefs and behaviours. A qualitative study design was therefore chosen over a quantitative design, so as to effectively address the study aim and objectives by exploring, investigating and interpreting the complex reality of the human perspective and unique lived experience (Renjith *et al.*, 2021). Qualitative designs were considered most appropriate for this study because they provide deeper understanding of the human feeling, nuances, contexts and complexities behind accessing and using different knowledge in different ways (Renjith *et al.*, 2021).

Consideration was then given to the ontological and epistemological assumptions underpinning qualitative research designs, as the worldviews of the researcher have an impact on the way research questions are developed and the methods to which they are then studied (Flick, 2020). Ontology can be described as the study of the nature of reality or being, whilst epistemology refers to the study of knowledge and knowledge production (Bryman, 2008; Flick, 2020). This study took a broadly relativist ontological approach, which is grounded in qualitative research and considers multiple realities through the eyes of multiple people, which are the product of human action and interaction and which do not exist separately from research (Bryman, 2008; Braun and Clarke, 2022). Following on from this, a broadly constructionist, subjective epistemological approach was taken, in which it is acknowledged there are multiple ways to understand these multiple perspectives and there is no single, observable, ‘universal truth’ (Bryman, 2008; Gray, 2009; Flick, 2020). Studies grounded in constructionism are typically qualitative and importance is given to meaning-making, human experience and human context. Taking these approaches therefore allowed the candidate to consider all beliefs and viewpoints of participants, acknowledging that they each have different contexts and multiple experiences, enabling a deeper understanding of participants’ meanings and offering a broad insight into multiple attitudes, beliefs and behaviours.

Traditional, well-established qualitative methods were considered to answer the research question, as well as some qualitative approaches more commonly seen in KM. Because KM is about context and relationships, it was therefore important to consider methods aligned to the discipline. The following sections provide an overview of these qualitative methods, followed by the justification and rationale behind both the final method and the theoretical perspective chosen.

3.2.1 Focus groups

Focus groups originated in communications and marketing research (Turney and Pocknee, 2005), but have grown as a robust method of qualitatively collecting data across health and health services research, which have included topic areas similar to this thesis around exploring the attitudes and needs of healthcare staff (Kitzinger, 1995). They provide an opportunity to observe meaning and data being actively co-developed (Wilkinson, 1998) between small groups of people who either share a characteristic (homogenous groups, promoting trust and openness) or don't share a characteristic and bring different perspectives to the conversation (heterogeneous groups, promoting spontaneity and honesty) (Löhr, Weinhardt and Sieber, 2020). Focus groups differ from interviews in that they explore group discussion and group dynamics; the emphasis is on interaction within the group (Bryman, 2008). This is in contrast to interviews, which explore the perspective of the individual.

Focus groups were considered for several reasons. Firstly, the literature agrees that focus groups may lead to reduced interviewer bias and response behaviour (Löhr, Weinhardt and Sieber, 2020), in which participants may give the answers they think the researcher is looking for. Secondly, focus groups are more unstructured than interviews, encouraging participation and interaction which helps people to explore their views in different ways with others (Bryman, 2008), particularly if the researcher uses a series of open ended questions to generate natural conversation (Kitzinger, 1995). Focus groups provide an opportunity to observe the co-creation of knowledge (Wilkinson, 1998; Bryman 2008) by observing a broad range of everyday social interaction, experiences, viewpoints, cultural values and group norms in a particular population that would be less pronounced in an interview setting (Marques *et al.*, 2021). For example, participants may change their views during the conversation through listening to others or contribute something they had not thought about before. The human centred nature of qualitative research is therefore reinforced, which is particularly useful in exploring workplace cultures (Kitzinger, 1995) such as FCP.

Challenges to focus groups include the risk that emerging group ideas may result in interesting individual views being suppressed, or that participants may express more culturally or socially expected views (Bryman, 2008). Conformity bias, when people agree with the views of the majority in order to be accepted by a social group (Padalia, 2014) may also be a risk of focus groups. Furthermore, as acknowledged by Kitzinger (1995), although more confident individuals can actually break the ice for shyer ones and provide mutual support, it can be argued that existing professional hierarchies, whether or not the group know each other, and varying levels of individual confidence to contribute to discussion may adversely impact dynamics and interaction (Bryman, 2008).

3.2.2 Interviews

Individual interviews between a researcher and a participant are used to explore in-depth, honest views and experiences of individuals around a topic area (Sy *et al.*, 2020; Renjith *et al.*, 2021). They can be structured (for example based on a fixed questionnaire), semi-structured (with a topic guide to steer the conversation to pre-determined areas of interest), or unstructured (where participants are allowed to talk freely about whatever they wish within a broad area) and usually last between 30 –90 minutes (Brinkman and Kvale, 2015).

Semi-structured interviews are a flexible, iterative conversation and the most frequently used qualitative data source in healthcare research (Dejonckheere and Vaughn, 2019). They have the capacity to promote narrative and reflection and build confidentiality and trust (Löhr, Weinhardt and Sieber, 2020), therefore allowing the researcher to explore and understand the topic area in-depth from different perspectives. Participants are able to speak freely and are not influenced by peers or senior staff, which is a potential risk in group environments.

Concerns for using semi-structured interviews include the risk of interviewer bias and response behaviour (Löhr, Weinhardt and Sieber, 2020), in which participants may also give the answers they think the researcher is looking for. Semi-structured interviews can also be difficult to conduct with competing distractions and outside interruption and if lacking in sufficient depth, will not generate meaningful analyses or useful data (Braun and Clarke, 2021b).

3.2.3 World Café

First introduced in 1995 by J. Brown and D. Isaacs, the World Café (WC) method was considered for this KM thesis because it enables non-hierarchal and diverse groups of participants to exchange opinions on lived experiences and co-create contextualised, practical knowledge themselves (Löhr, Weinhardt and Sieber, 2020). The approach elicits a participant's feeling or opinion independently from a researcher's question, thus enabling participants to act as knowledge producers and reducing the risk of researcher bias. WC has the potential to uncover and co-create a large range of new ideas through group reflection and be adaptable to different contexts (Löhr, Weinhardt and Sieber, 2020), which is highly relevant for potential KM. A key element of WC is that participants are able to talk freely in a relaxed, informal and creative environment (Löhr, Weinhardt and Sieber, 2020) which promotes more of a two way exchange of knowledge via relationships, lending itself well to key principles of KM by moving participants away from simply transferring knowledge to a researcher.

WC traditionally stems from a drive to bring about a community change or determine a solution to a problem (Löhr, Weinhardt and Sieber, 2020) and so very few studies have traditionally utilised this approach in healthcare (Löhr, Weinhardt and Sieber, 2020). However, more recently, similar approaches have been used successfully to support healthcare improvement design. Examples of this include investigating the perspectives of key stakeholders around multi-disciplinary health and social care professional teams in Irish Emergency Departments (Cassarino *et al.*, 2020) and improving clinical care for children and young people with Juvenile Adolescent Idiopathic Arthritis (McErlane *et al.*, 2020).

Another component of WC is the café ambiance, from which the method gets its name, which posed potential challenges when considering issues relating to study conduct in the context of COVID-19 and the health concerns for participants and researchers meeting in person during the pandemic. Furthermore, only a small number of questions can be asked during a WC event, restricting the depth of data and so WC is often used to complement other methods (Löhr, Weinhardt and Sieber, 2020).

3.2.4 Collective making

A method grounded in KM theory and principles, and therefore considered as an approach, was collective making. Collective making appreciates that knowledge will be more implementable if it is created with the stakeholders who will be using it, within the context of where it will be used. The method supports working *with* users rather than *for* users, to collectively create actionable products (Langley, Wolstenholme and Cooke, 2018). Examples of collective making are Lego Serious Play, drawing, animation and role play (Langley, Wolstenholme and Cooke, 2018). As a novel methodology, evidence of specific, successful use of collective making in qualitative research is limited. It has also been reported that the approach has limitations such as time taken, complexity, cost, and lack of engagement amongst patients and staff (Donetto *et al.*, 2015).

3.3 Considerations for online data collection methods

This study commenced in November 2020, eight months after the UK started its first lockdown following initial COVID-19 cases. It was important therefore to carefully evaluate the support for, and limitations of, multiple qualitative methods and their adaptability to the online space, and due to the novel logistical and safety concerns prompted by the pandemic and its unknown nature, length and scale, the decision was made to use online methods of data collection.

Prior to 2020, online methods had not been extensively used in research (Archibald *et al.*, 2019), however the global impact of the pandemic sparked an emerging field of literature that has started to explore the processes, challenges, and characteristics of research conducted online (Torrentira and Moises, 2020; Vindrola-Padros *et al.*, 2020; Dodds and Hess, 2021). Online and remote methods of data collection present the opportunity to flexibly and quickly connect with people from around the globe, thus enabling more participants to contribute to the research and offering flexibility in regards to time (Turney and Pocknee, 2005). This has the potential to offer a very broad geographical, professional and economical sample of participants for research, supporting the need to explore a range of contexts and environments in order to bring about successful implementation. Given their inclusive nature, meetings held on virtual platforms are becoming more commonplace for researchers and HCPs because they enable increased outreach to more varied stakeholders (Rubinger *et al.*, 2020).

Literature published before and after the pandemic agree that interviews and focus groups not conducted in the traditional face-to-face manner still produce similar themes and quality of data (Campbell *et al.*, 2001; Sturges and Hanrahan, 2003; Vindrola-Padros *et al.*, 2020), however any method chosen must still be able to adequately address a research question. Online focus groups have been found to provide clearer conversation flows as participants do not tend to talk over each other as much (Varma *et al*., 2021). Telephone interviews, which are commonplace in the literature (Drabble *et al.*, 2016; Hanks, Eloi and Stafford, 2019; Bassett and Jackson, 2021) are particularly useful to access hard to reach groups, for interviewer safety, for privacy, for reduced cost and because perceived anonymity encourages the discussion of sensitive topics (Sturges and Hanrahan, 2003). However, they may not enable the same rapport as face-to-face conversations and the researcher is not able to observe informal, nonverbal communication (Sturges and Hanrahan, 2003). Interestingly, for this KM study, rapid online qualitative research necessitated by the pandemic aimed to produce findings that could be quickly and directly implemented into policy and practice, with academic audience interest as a secondary consideration (Vindrola-Padros *et al.*, 2020).

A limitation of online methods of data collection is the potential risk of marginalising or excluding those with poor digital literacy. However, evidence suggests that in January to February 2020, 96% of households in Great Britain had internet access, a significant increase from 57% in 2006 (Office for National Statistics, 2020). During the pandemic, many more people became familiar with online communication and it could be assumed that digital competences had also improved, particularly amongst the participant population of professional FCPs, consequently making participation in online research data collection easier (Lobe, Morgan and Hoffman, 2020). Certainly any shift from face-to-face to online data collection needs to be carefully considered. Sy *et al.*, (2020) highlight the need to translate the quality and rigor to the online space by maintaining reflexivity, ensuring data is sufficient and robust, being authentic and demonstrating trustworthiness by clearly describing online methods. Additionally, online considerations around data protection and data storage must be addressed (Sy *et al.*, 2020).

Whilst qualitative interviewing using video conferencing does have drawbacks, including challenges around establishing interpersonal connections and technical challenges (Sedysheva, 2020), during the course of COVID-19 several studies explored video calls as a viable and commonplace mode to conduct in-depth, semi-structured interviews. Practical considerations, such as not needing to travel to an interview, being able to turn the video camera off or using pseudonyms (Varma *et al.*, 2021) were considered as important for participants.

3.4 Justification of choice of study methods

Aligning to KM principles and practice, it was important to consider WC and collective making alongside the more traditional data collection methods of focus groups and interviews. However, on balance, WC wasn't appropriate because the key aim of the method is to co-produce a solution to a problem. Using the WC method would therefore not have answered the research question for this study, given that its aim was not to solve a problem but instead to explore if, how and why Twitter can be used to mobilise knowledge to inform FCP clinical practice. Furthermore, the COVID-19 context prevented the café ambiance from being created in a face-to-face environment. As a co-production method, collective making would also not have addressed the research question for this study appropriately, as this study did not aim to co-create knowledge with the stakeholders who would be using it, rather it set out to explore and understand the attitudes, beliefs and behaviours of a group of people.

Although focus groups are a robust and established method which could have potentially been modified for an online environment, the possible disruption of social interaction because of COVID-19 was deemed to be too important to overlook. This viewpoint was supported by the argument posed by Sy *et al.* (2020) that the nature of focus groups is to bring people together and co-create meaning, therefore they would be likely to be particularly affected by social distancing measures and virtual environments.

Individual semi-structured video interviews were chosen as the primary research method to answer the research question. This was because the confidential nature of interviews allows opportunity to build the trust needed to explore insights and views. They promote open narrative and deeper reflection amongst participants to explore and share their insight and views, without influence from their peers. The semi-structured nature allows for flexibility in which to encourage participants to further develop interesting thoughts and ideas, providing unique insights into how participants view the world. Furthermore, there is a wealth of existing literature to support interviewing as a robust qualitative method for data collection and emerging evidence to show that remote interviewing (particularly important during COVID-19) yields similar richness of knowledge and depth of human experience as in face-to-face. Finally, by using video interviews, a broader geographical range of participants could also be included and at times more convenient to them, which was an important consideration when interviewing busy HCPs.

3.5 Justification of theoretical lens used

As a KM study, this thesis needed to be informed by KM theory and situated within the KM literature and context. However, as discussed in Section: 2.5 Theory in knowledge mobilisation, much of the theoretical literature surrounding KM aims to plan, understand or explain the implementation or adoption of best practice and many are targeted at a system or organisational level, looking at what works and doesn't work. In order to give a rich, contextualised, KM insight into the interactive human processes behind FCP's use of knowledge from Twitter in clinical practice, John Gabbay and Andrée le May's mindlines model was chosen as an additional lens through which to interpret the semi-structured interview data. Originally conceptualized in their ethnographic study in 2004, mindlines are defined as "internalised, collectively reinforced and often tacit guidelines that are informed by clinicians' training, by their own and each other's experience, by their interactions with their role sets, by their reading, by the way they have learnt to handle the conflicting demands, by their understanding of local circumstances and systems, and by a host of other sources" (Gabbay and le May, 2011, p. 44).

In the healthcare context, mindlines have been found to be used by clinicians, patients and commissioners (Wieringa and Greenhalgh, 2015; Cowdell, 2018; Cowdell, 2019; Gabbay *et al.*, 2020) to guide decision making, often in complex, highly pressurised environments, and are more than just simple heuristics or instinctive 'rules of thumb.' Whilst guidelines are seen by physiotherapists as important, socially constructed tacit knowledge shared between peers are also believed to be necessary when considering changes to their clinical practice (Restall, Diaz and Wittmeier, 2020). Gabbay and le May found that clinicians rarely accessed codified, explicit knowledge such as research knowledge or clinical guidelines directly for decision making, of which the latter are often ignored in practice as ‘management tools’ anyway (Gené-Badia *et al.*, 2016). Instead, explicit and tacit knowledge is incorporated into individual mindlines, which are continuously constructed, challenged, and reinforced collectively through informal conversation with peers (Gabbay and le May, 2016). The socially constructed nature of mindlines was important to note in the context of Twitter, because mindlines offer a ‘negotiation space’ where decision making is taken from a range of different social sources (Gabbay and le May, 2011). An example of this in the offline space is explained by Ducey *et al.* (2020), who used the mindlines model to show how collective mindlines can be challenged and adjusted, when the use of transvaginal mesh in pelvic floor surgery was taken up and then abandoned due to anecdotal patient experiences rather than EBM. Furthermore, mindlines take a constructionist approach to knowledge creation and use (Gabbay and le May, 2011; Wieringa and Greenhalgh, 2015), which is dependent on social relations and how people make sense of the world around them - reflecting the philosophical underpinnings of this thesis.

Mindlines encompass and take into account a diverse blend of different types of explicit and tacit knowledge (such as on Twitter) for clinical decision making, and are actively tried, tested and contextualised in the real world, known as Knowledge-in-Practice-in-Context (Gabbay and le May, 2011). The mindlines model provides a solution to expand on EBM and think wider than traditional, restrictive knowledge and evidence hierarchies to produce richer and more contextualised knowledge, by broadening and deepening understanding of different types of evidence and tacit knowledge used in clinical decision making (Wieringa and Greenhalgh, 2015) and therefore increasing the likelihood of knowledge being used in practice. Whilst the principle of clinical practice grounded in the best available evidence is not disputed (Gabbay and le May, 2011), there is still an inherent gap in practical knowledge, highlighted by the rise of applied, solution-focused research which tends to describe mindline-promoting KM approaches such as relationship nurturing and collaborative learning (Wieringa and Greenhalgh, 2015). It is important to note that mindlines do not reject EBM, rather they offer a way of adapting explicit guidelines and research evidence to the context and complexity of clinical practice, and acknowledge that HCPs and other KM stakeholders have competing evidences to draw upon (Powell, Davies and Nutley, 2017).

In their original 2004 study, Gabbay and le May only tested mindlines in one General Practice, checking them in a contrasting practice. Although they used rich, thick descriptions of findings to enhance trustworthiness, the authors noted that as an ethnographic study in one General Practice population there may be much more variation within the UK, consequently calling for further similar work to determine the transferability of their findings to other contexts. However, several studies since then have described mindlines in different populations across varying online and offline contexts internationally, (Cunningham and Shirley, 2015; Wieringa et al., 2018;

Cowdell, 2018; Cowdell, 2019; Lander and Balker, 2019; King, Sanders and Tod 2021), demonstrating their presence across several different organisational and community cultures.

A more recent mindlines study by Cowdell (2019) clearly aimed to use the mindline model to understand how primary care practitioners (GPs, nurses, health visitors and pharmacists) constructed eczema mindlines and their approaches to self-management. By using the lens of mindlines to interpret ethnographic and interview data, the study found that practitioner eczema mindlines are developed over time and mostly based on tacit knowledge and experience. The authors included and described the contribution of PPIE. The study may have been limited however in that although it covered multiple professional disciplines, the data was collected from just one General Practice, potentially limiting the transferability of findings. Additionally, the researcher was a lone worker and completed the data analysis alone, however the author does note that conversations took place with participants to check data had been understood correctly and researcher reflexivity was described, adding trustworthiness to this qualitative work. Despite these limitations, the study highlights the role that mindlines play in knowledge mobilisation and points towards the need for more solution focussed work - discussing the need to delete old or incorrect information from practitioner eczema mindlines and find ways to enhance them with trusted and useful knowledge, thus improving patient care.

The mindlines model consequently goes some way in helping to develop new insight around if, how and why Twitter can be used to mobilise knowledge to inform FCP clinical practice, as a stimulus to understanding how knowledge is incorporated into clinical decision making. Furthermore, the model can be used to identify potential opportunities in the development of FCP mindlines for Knowledge Mobilisers to actively engage and communicate MSK research to FCPs via Twitter. For example, although the process of knowledge development is believed to be organic rather than rational (Wieringa and Greenhalgh, 2015), by understanding the knowledge needs of FCPs and the process by which they acquire this knowledge on Twitter, Knowledge Mobilisers could use the platform as one of many tools to enhance FCP mindlines through signposting, sparking clinical interest in knowledge and opening up valuable conversation.

3.6 Stakeholder Advisory Group

SAGs consist of individuals who can represent the perspectives and context of a diverse range of people, including lived experiences or professional viewpoints, in relation to research based healthcare-related topics (Deverka *et al.*, 2013). Engagement with stakeholders in research is a two-way conversation which encourages shared learning, understanding and decision making about the design, conduct, and implementation of research and as such is an integral part of KM. Various descriptions for stakeholders exist and overlap in the published literature, however, for the purpose of this thesis, stakeholders are defined according to Deverka *et al.* (2013) as being; "Individuals, organisations or communities that have a direct interest in the process and outcomes of a project, research or policy endeavour" (Deverka *et al.*, 2013, p5).

Including a range of knowledge, experience, judgement and values from the people who would be affected by, or have interest in, the study findings from the start may make study results more relevant and appropriate. Collaborating with multi-stakeholder groups supports the co-production of findings and aims to soften the line between academia and practice (Rycroft-Malone *et al*., 2016) so as to facilitate implementation and to maintain relevance throughout research. Importantly for KM, this would then have significant potential to "move research evidence off of bookshelves and into practice" (Concannon *et al*., 2012, p990). Equal social relationships experienced in multidisciplinary SAGs lend tacit knowledge and human experience to the design of the research and the interpretation of findings, which has been termed 'knowledge-based practice' (Glasby and Beresford, 2006). Furthermore, recent studies have shown the power of stakeholder's tacit knowledge to optimise implementation, even if stakeholders themselves are unaware of their role in mobilising knowledge (Swaithes, Dziedzic, Finney, *et al.*, 2020).

Stakeholder Engagement in this study

A multidisciplinary range of stakeholders were engaged on an ongoing basis throughout the study to provide a deeper understanding of the range of different contexts and perspectives that may be of interest to the research question, to inform the methods and focus of data collection and to provide external scrutiny and insight to the study. The lack of published literature addressing the objectives of this study necessitated the inclusion of multiple invested voices in order to co-develop and shape thinking as the study started and progressed. It was important to include the insight of stakeholders to influence the collection of relevant and applicable research findings, which would be more aligned to and useable in real world clinical practice. Stakeholders included patients and the public, academics, FCPs, physiotherapists, a marketing professional and Knowledge Mobilisers.

The final study design is represented visually in Figure 5: Visualisation of study design, and highlights at which points the SAG was consulted during the study.

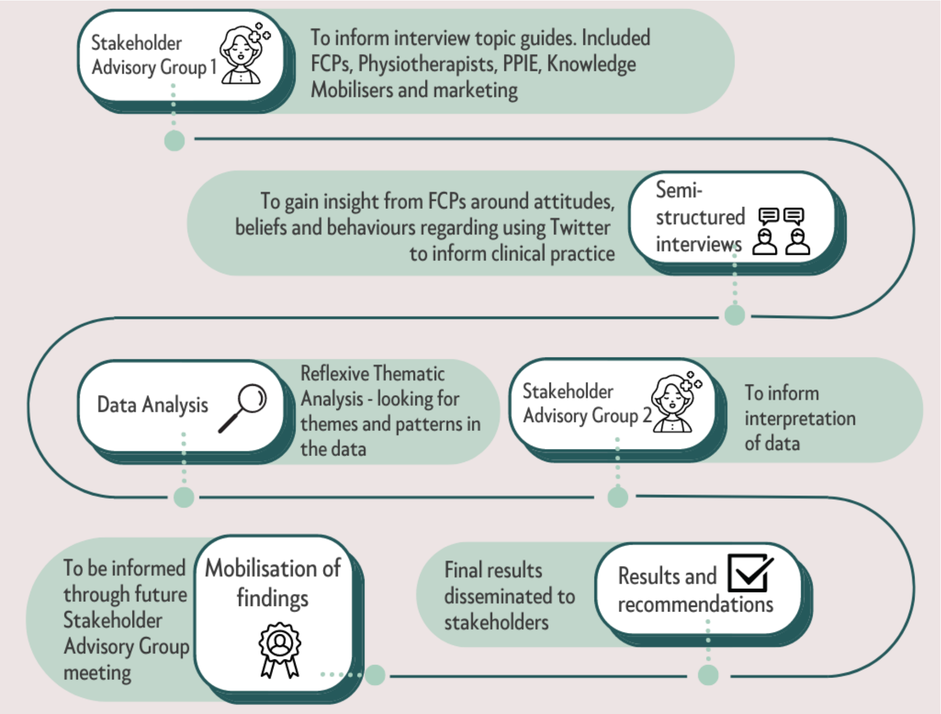


Figure 5: Visualisation of study design

As discussed by Boaz *et al.* (2018), it was decided at the start that members involved in the SAG may change iteratively over the course of the study, depending on its development. The SAG was informed by practical considerations identified by Concannon *et al.* (2019) (See Appendix 7- Considerations when engaging stakeholders) which included; careful consideration of the reasons for engaging with stakeholders; which communities to engage with; the extent of engagement; the roles of stakeholders and the ways they would be involved; and preparation for conflict management and any conflicts of interest. The design principles developed by Boaz *et al.* (2018) for engaging stakeholders in research were used to guide the organisation, values and practice of the SAG. Further to this, in the context of the COVID-19 pandemic, virtual considerations were taken into account using guidance from Rubinger *et al.* (2020), who advised; pre-planning for technology accessibility; planning the format of the virtual meeting; accomplishing meeting goals, and; responding to these goals by planning next steps and feeding back to the group (see Appendix 7- Considerations when engaging stakeholders).

The aims of the multi-disciplinary SAG for this study were:

1) To inform the content of the interview topic guides, linked to study aims and objectives (meeting one, held June 24th 2021), which are included in Appendix 5 – Topic guide 1, Twitter users and Appendix 6 – Topic guide 2, non-Twitter users

2) To inform interpretation of data to maintain context, to determine recommended tweet formats from the data (meeting two, held April 26th 2022)

Interview topic guides were developed iteratively throughout the analysis process with input from the SAG to reflect unanticipated findings and to probe deeper on pertinent issues. This was particularly important as early interviews are known to raise issues that may not have been anticipated from the background literature and additional questions or changes may be made to subsequent interviews (Ziebland and McPherson, 2006).

PPIE involvement in this study

SAGs including patients and the public can directly inform and support study design, resulting in research findings that are relevant and applicable to real world clinical practice (Deverka *et al.*, 2013). To ensure meaningful PPIE input into this study, in terms of sense checking and providing external scrutiny, three Link Group members were invited to join the SAG and have had close involvement throughout the study, ensuring a strong patient and public voice throughout. During SAG meetings, Link Group members provided insight into the study from a patient and public perspective and directly informed the content of the semi-structured interview topic guides. Furthermore, given their experience of working on implementation and KM projects, they maintained an additional focus on keeping the findings relevant and useful for eventual mobilisation.

To ensure that the Plain Language Summary of the study was appropriate and understandable for a public audience, Link Group members co-wrote the Plain Language Summary with the candidate and they gave additional feedback on the visual abstract for professionals. The candidate went on to work further with one Link Group member to support her to develop plain language writing guides for other researchers. These are included in Appendix 13 – Plain language guides. To ensure meaningful and collaborative PPIE, involvement followed the UK Standards for Public Involvement in Research (NIHR, 2019) which included financial reimbursement for their time, and support before and after meetings was offered if needed.

3.7 Sampling and recruitment to interviews

Participants were recruited using purposive sampling, by engaging with existing networks within the IAU team in Keele University's School of Medicine, through the CSP FCP mailing list and national and local FCP networks, and by advertising via the IAU's Twitter account (See Appendix 2 – Recruitment advertisements). Social media posts included a mixture of images and text and varied approaches to appeal to a diverse range of potential participants. This included the use of hashtags, to link up and connect with people with similar interests (Pizzuti *et al.*, 2020) and relevant stakeholder groups who may be interested in disseminating to their networks were tagged in posts. These included the CSP (@thecsp), Keele University School of Medicine Research (@SoM_Research), the Council for Allied Health Professionals Research (@OfficialCAHPR) and Versus Arthritis (@versusarthritis). Simple images were posted alongside informative text about the study and the contact details of the researcher, so as to grab attention and be more memorable than text (Defeyter, Russo and McPartlin, 2009). Although a mixture of first and third person narratives were used, the first person voice was favoured in order to appeal to people's desire for social belonging (Chang *et al.*, 2019). Potential participants were initially purposefully sampled to include a range of individual qualified MSK FCPs working in a range of employment arrangements, with varying backgrounds and experiences from across England. A small amount of MSK FCPs who do not use Twitter were also sampled to achieve a broad range of perspectives, including why people do not use Twitter. Purposive sampling allowed the candidate to interview a broad representation of MSK FCPs and therefore increase the data credibility (Renjith *et al.*, 2021).

The candidate approached the FCP Lead and communication team at the CSP, Keele Allied Health Professionals (AHP) Critically Appraised Topic (CAT) group leads and contacts at Versus Arthritis to request that a general expression of interest advert was disseminated via email and social media to their networks (See Appendix 2 – Recruitment advertisements). The IAU Manager approached individuals in the unit's HCP training networks, by emailing a general expression of interest advert. These 'gatekeepers' were trusted sources that supported the collection of data covering a range of attitudes, beliefs and behaviours relevant to the research objectives (Dejonckheere and Vaughn, 2019). Email was used to capture interest from potential participants not on social media. Participants were asked to take part in their own time, away from NHS practice.

Following initial purposeful sampling, a snowball sampling technique (Renjith *et al.*, 2021) was used whereby participants recommended or contacted other suitable potential participants. Although a concern of snowball sampling is that key people are likely to be nominated often (Emmel, 2013), this method enabled recruitment of participants outside of existing and familiar networks and therefore facilitated the opportunity to collect a broad range of perspectives. The inclusion criteria were:

- Currently employed as an MSK FCP
- Working in primary care

- Working in England

The exclusion criteria were:

- Does not speak English
- Does not have capacity to give informed consent

The recruitment process is outlined in Figure 6: Participant recruitment process, which highlights the two study advertising routes taken and subsequent steps towards recruiting to interview. The consent form and participant information sheet can be found in Appendix 3 – Participant consent form and Appendix 4 – Participant information sheet.

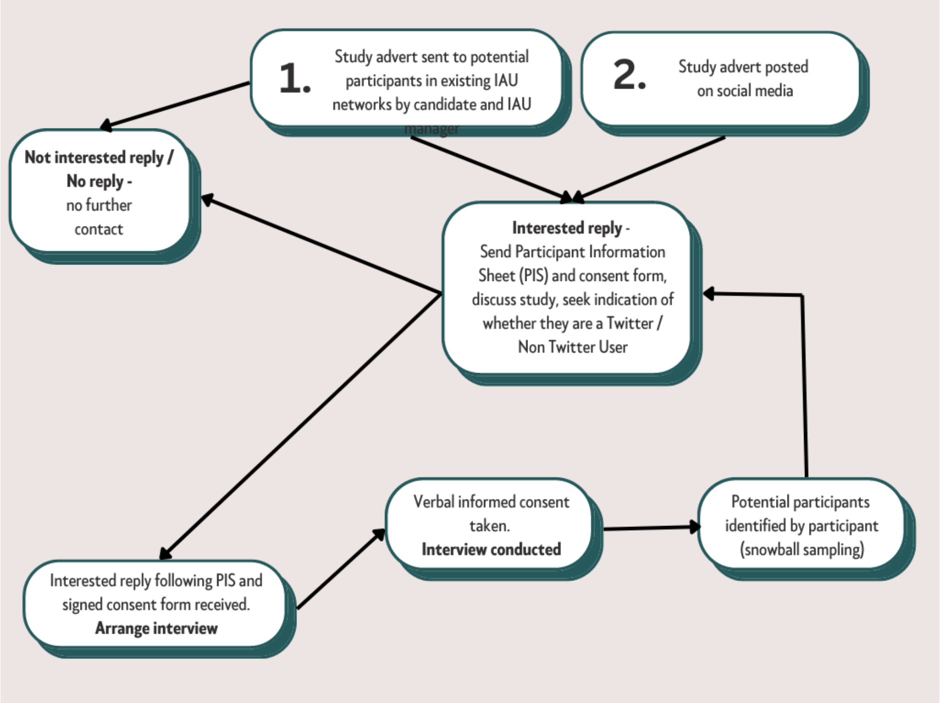


Figure 6: Participant recruitment process

The candidate offered practice sessions on MS Teams before the interviews took place to support participants to feel confident in using the video conferencing software (Archibald *et al*., 2019, Lobe, Morgan and Hoffman, 2020). This allowed for troubleshooting with regards to network connectivity and the functions of MS Teams for those who were not familiar with the software.

A-priori sample size calculations are not used in qualitative research (Renjith *et al.*, 2021), however the literature recommends that an initial approximation is useful for research design (Malterud, Siersma and Guassora, 2016), and so between 12-20 participants were planned for. Recruitment to interviews continued up to the point where no new themes emerged and when the candidate began to hear repeated themes in interviews. This has been described as inductive thematic saturation (Saunders *et al.*, 2017) and adequate 'information power' – i.e. the amount of participants is dependent on the amount of information in the sample relevant to the study (Malterud, Siersma and Guassora, 2016). Ongoing reflection on the richness of the data took place as the interviews progressed (Malterud, Siersma and Guassora, 2016; Braun and Clarke, 2021b).

3.8 Data collection

Ethical approval was obtained by Keele University's Faculty of Medicine and Health Sciences Research Ethics Committee (FMHS FREC) 28.10.21 (REC Reference: MH-210199) with no conditions (see Appendix 1 – Ethical approval). Two pilot interviews were firstly carried out with FCP members of the SAG (who were excluded from the study) to test and refine topic guides further and ensure that questions were not leading, did not contain jargon and elicited appropriate responses. The candidate also practiced interview skills with peers and attended qualitative methods training which covered interview methods. It was anticipated that each interview would take between 30-60 minutes and was conducted via MS Teams to enable participants to turn their camera off if they wished to before the digital voice recorder was turned on. Video content was not recorded. If participants chose to be interviewed over the telephone, the candidate planned to call them so there would be no cost to the participant. A semi-structured interview approach was used, allowing the candidate to use the topic guides to facilitate discussion whilst keeping in mind the overarching key discussion areas identified by the SAG and discussed in the literature. The interviews ended when the participant and candidate agreed further discussion would not provide further data.

Transcripts were pseudonymised so that participants could not be identified. References that might identify a person, or an institution (e.g. GP, clinic or hospital) were removed. A transcription service (www.thetranscription.co.uk) was used to transcribe 17 interviews with the candidate transcribing the first two, to start to become familiar with the data.

3.9 Data Analysis

Data analysis for this thesis has been informed by the principles of Reflexive Thematic Analysis (RTA). Sitting within the qualitative research paradigm, RTA offers an accessible, interpretative lens to analyse data (Braun and Clarke, 2021b). Notable proponents of RTA Braun and Clarke describe the method as a way of facilitating the identification and analysis of patterns, meanings and themes in a data set (Braun and Clarke, 2021b). RTA is often used in applied research (Braun and Clarke, 2014) and can result in final themes which should point to actionable items (Campbell *et al.*, 2021). Subsequently RTA lends itself well to the contextual and pragmatic principles of KM and the eventual impact and relevance of findings. Furthermore, the flexibility of RTA was chosen to allow analysis which captured both semantic (otherwise known as descriptive; looking at explicitly stated themes and examining the words at face value) and latent (otherwise known as interpretive; finding underlying meanings to explain the data) content for in-depth interpretation. It is acknowledged that the terms ‘semantic’, ‘descriptive’, ‘latent’ and ‘interpretive’ are used to varying extents within the literature, however, for clarity within this thesis, the terms ‘descriptive’ and ‘interpretive’ will be used.

Original published literature on Thematic Analysis (Braun and Clarke, 2006), did not explore the researcher’s role in knowledge production. However, the more recent approach of RTA has since furthered the original thinking, and was chosen for this thesis to allow the candidate to actively create knowledge from the data in an iterative manner. RTA is theoretically flexible (Braun and Clarke, 2021a), which allowed for considerable freedom for the candidate to apply mindlines as a lens to interpret the data.

The data analysis took a largely inductive (driven by the data as opposed to the literature) approach, accepting that generated codes and themes can change, be added, or removed as analysis progresses, which enabled the candidate to derive meaning and create themes away from preconceived ideas and be reflexive in this process. It is acknowledged however, that this inductive approach would have been influenced to some extent by existing theory (mindlines) as well as knowledge gained through the SAG and literature review at the start of analysis. However, the study did not aim to prove or disprove a pre-existing theory, therefore could not be described as taking a deductive approach.

An outline of the RTA process as recommended by Braun and Clarke is presented in Table 1: Reflexive Thematic Analysis steps.

Table 1: Reflexive Thematic Analysis steps

Source: Adapted from (Braun and Clarke, 2021b, pp. 35–36, 2022)

Stage	Description
Familiarisation with the dataset	Transcripts are read and re-read for immersion and familiarity with the descriptive content of the data. Initial observations and insights are noted and audio recordings are listened to, to check for accuracy
Coding	Interesting segments of data across the dataset are highlighted and captured as short, succinct descriptions known as codes. Codes are used to capture single meanings and concepts and start very descriptive, moving to be more interpretive as analysis progresses. Potential extracts from the data (quotes) relating to codes are compiled concurrently in memos for future reference
Generating initial themes	As initial patterns of meaning are identified across the dataset, corresponding codes are clustered into categories which share a particular meaning or idea, known as a central organising concept. This process starts to provide insight into initial themes and is done through several iterative stages, with the transcript data continuously and concurrently reviewed, and quotes collated with the relevant themes. Duplicate and similar codes are combined and deleted at this point. This provides a starting point for further review and refinement in the process of generating the final themes
Developing and reviewing themes	It is important to ensure depth to the data rather than breadth, therefore, the initial themes are further developed and reviewed. This is carried out for example through further checks against the coded data to see that initial themes address the research question, and the development of thematic maps to explore relationships between themes and to create the overall picture for the analysis narrative
Refining, defining and naming themes	Once clear boundaries between themes are achieved, final themes and any subthemes are named and briefly defined. A final thematic map is developed at this stage to think about the relationship between the themes and subthemes
Writing up	The analytic narrative and supporting data extracts (quotes) are written up and contextualised in relation to existing literature

Data analysis process taken in this thesis

Given RTA's multifaceted process of interpretation and analysis, the candidate expected to continuously go back and forth to the data, which enables deeper reflection for richer meanings. Although Braun and Clarke recommend six steps to RTA, these are intended as a guide only and it is acknowledged that analysis is not expected to move sequentially through the steps, instead there is fluidity between them. Therefore, the candidate used the six steps as a starting point but particularly as analysis progressed, went back to different steps on several occasions. By taking this iterative and flexible approach, codes and themes were added, removed, reconsidered and developed over the course of analysis. This allowed for deeper layers of understanding of the data to be achieved and therefore a richer narrative to be formed. Regular, dedicated analysis meetings were held twice a month with the immediate research team which enabled deeper interpretation. Further to this, the candidate scheduled a meeting with additional experienced qualitative research colleagues towards the end of data analysis for further insight and reflection. Additionally, it was decided to hold a second SAG after approximately four months of data analysis to present and discuss findings and ensure context to the data was maintained. As analysis progressed and the same codes started to be used repeatedly, SAG members suggested the inclusion of additional questions in the topic guides to elicit deeper data from these key areas. Additionally, some questions were reordered in order to facilitate more natural bridges between conversation topics. Given their expertise and experience, during the second SAG the Link Group members supported the sense checking of the initial themes from the data. For example, they suggested combining all themes relating to ‘knowledge’ and highlighted the importance of including a theme which addressed the more negative side of Twitter use.

A broad account of the process taken during RTA for this study aligning to Braun and Clarke’s six steps is outlined below.

Familiarisation with the dataset - The candidate transcribed the first two interviews and the remainder were transcribed by an approved transcription company. Following this, all transcripts were read and re-read for immersion and familiarity with the dataset. Initial observations and insights were noted in the form of memos and audio recordings listened to for accuracy. Participants were given codes for pseudonymisation according to the order in which they were interviewed (indicated by P01, P02, etc.) and whether they were a Twitter user (indicated by T) or non-Twitter user (indicated by NT). Examples of initial observations and memos can be found in Appendix 12 a – Extract from memos.

Coding – Descriptive codes were firstly captured systematically using the comments box function in Word and an example of how this was done can be found in Appendix 12 b – Screenshot of coding. Although there were no a-priori ideas concerning codes, the candidate was aware at this stage of the mindlines model, the background literature concerning FCPs, KM and social media and discussions in the first SAG had highlighted contextual issues for FCPs. It is therefore acknowledged that the coding process would not have been entirely inductive, however the candidate endeavoured to be as neutral and open minded as possible and kept a reflexive diary to be aware of how this knowledge, plus individual experiences, could influence the analysis. Further details can be found in Appendix 10 – Examples from reflexive diary and Appendix 11 – Positionality statement.

Coding became more interpretive as analysis progressed and quotes from participants started to be collected. Double coding of a subset of transcripts took place. When coding was complete, 1863 codes were copied from Word into an Excel spreadsheet, with each column listing all the codes relevant to each participant. This can be seen in Appendix 12 c – Screenshots of initial code spreadsheets.

Generating initial themes - Duplicate and similar codes were then deleted or combined, for example, the codes ‘intimidation’ and ‘intimidating’ were combined as ‘intimidation’. This left 578 codes. Initial patterns of meaning were then identified from these 578 codes and codes were clustered together into categories that share a particular meaning or idea (central organising concept). For example, codes such as ‘workload,’ ‘toxicity,’ ‘hostility’ and ‘bullying’ were clustered together under the central organising concept of ‘barriers to use.’ This resulted in 19 initial themes being generated. These initial themes and their corresponding codes are included in Appendix 12 d – Table of initial themes 1.

Developing and reviewing themes - The 19 initial themes were checked again against the coded data and the whole dataset to make sure they explained the data and addressed the research question. Ongoing reflection and discussions with supervisors and colleagues were used to refine and further interpret these descriptive themes. Thematic maps were developed to start to think about possible subthemes and the relationships between them, which resulted in the refinement of the 19 initial descriptive themes to six more interpretive initial themes (Summarised in Appendix 12 e – Table of initial themes 2). The first version of the thematic map demonstrated a large amount of overlap and connections between themes, indicating that the boundaries between themes were not clear and that the themes were still largely descriptive (Appendix 12 g – Thematic maps).

Refining, defining and naming themes – The six initial themes, along with their definitions, relationships and boundaries were presented and discussed at a dedicated SAG meeting (held 26.04.22). Themes were still considered largely descriptive and the candidate therefore took a step back from the codes and reflected on the overall narrative of the data. A meeting with experienced qualitative research colleagues (held 08.07.22) helped to identify this narrative, and with ongoing reflection three overarching themes and nine subthemes were generated. Subthemes were used to provide more interpretive depth to themes by highlighting pertinent elements within them. Boundaries were clarified and core concepts for each theme and subtheme were defined. Examples of coded data used for final themes and subthemes can be found in Appendix 12 f – Final themes with examples of coded data.

Writing up - Further analysis took place during the write up phase, whereby the names of the themes were further refined and subthemes were re-organised. A final thematic map (Figure 7: Final thematic map illustrating themes, subthemes and the relationships between them) was created to illustrate the relationship between these as well as a written summary (Table

2: Final Themes, Subthemes and Definitions). These can be found in Section 4.3 Thematic findings.

3.9.1 Reflexivity

The position of the researcher can impact on all aspects of the qualitative research process. Being reflexive of personal circumstances, experience, viewpoints and bias is therefore vital (Weiner-Levy and Queder, 2012). For example, the candidate's previous employment as a journalist required conscious effort to not ask leading questions in interviews, and careful considerations were taken so as not to influence participants with the candidate's knowledge of social media. To ensure these positions and others were taken into account, a positionality statement was therefore written at the start of the study for ongoing reflection (See Appendix 11 – Positionality statement) stating existing personal knowledge, experience and beliefs. This was then critically reflected on and updated throughout the study by the candidate in order to consider the research process and how this may be being influenced by the candidate, prompting self-reflection and consideration of ongoing personal beliefs, biases and judgements. A summary of this Positionality Statement is included below, whilst the full text can be read in Appendix 11 – Positionality Statement.

"My academic background includes a BA (Hons) degree in French, German and European studies followed by professional roles as a Translator, Newspaper Journalist, Magazine Editor, PPIE professional and Knowledge Broker. Inspired by my own personal patient journey I am a volunteer Senior Representative for the Scoliosis Association UK and have worked with hospital clinical teams to

transform clinical pathways and patient information for Children's Spinal Surgery. My academic interest in KM research and practice developed from my experience of working creatively with stakeholders to mobilise knowledge and have impact on patient care.

Through discussion with peers, reading and a personal research journal I was able to better understand my own position as a researcher within this study, reflecting on how I conducted myself and interacted with both participants and the data. This helped me to become more aware of how my own professional and personal experiences can influence my research. I have summarised my key reflections below:

- *As a journalist I was as unbiased and balanced as possible but the intended readership of an article as well as editorial steer sometimes resulted in writing taking on a certain 'slant' and interviews including closed, leading questions. I believe that like journalists, exploratory researchers cannot be completely value free and separate their personal perspectives, unconscious biases and past experiences. However, I strived to acknowledge these and ensure my research outputs were as unbiased, honest and transparent as possible by mitigating where I could. My journalism experience enabled me to encourage a relaxed rapport with participants for rich data but I did not disclose my former employment.*
- *As a confident social media user thanks to my communications background and employment as a Knowledge Broker, I became aware and sometimes frustrated that this may not be the case for others.*

- *As an outsider (Bourke, 2014), it was important for me to be aware of my knowledge gaps and lack of confidence as a non-FCP and as a student researcher. I will never fully understand the demands and pressures of working in professional clinical MSK settings and I have instead been both an MSK patient myself and worked with MSK patients – I am from 'the other side of the coin.' Awareness of this made me proactively try to further my understanding of the FCP role through discussions with FCP and clinical colleagues.*
- *I found data analysis challenging and struggled to move away from descriptive, journalistic style 'headlines' as theme names. My supervisors helped me to challenge this and become more neutral and nuanced. My positionality influenced what interested me in the data, as a communicator, social media user and patient advocate. I took care to constantly return to the research question.*
- *I have always worked in rapid, process driven and creative environments and the 'pushing out' part of the research cycle. It quickly became apparent to me that it would be a personal challenge to be in the more considered, slower research phase but once I acknowledged this early on it was easier to embrace the journey.*

The MPhil has changed me and my role. It has given me deeper insight into research, helped me to consider information more analytically, critically and contextually, and supported me to grow more confident in my understanding of KM."

The candidate maintained a reflexive diary throughout the study, as recommended by Braun and Clarke (2021b), to better understand the position and influence of the researcher and this included ideas, questions and lessons learnt to inform the thesis and future work. The reflexive diary enabled the candidate to further reflect on how previous and current roles and experiences influenced analytical interpretations, subsequent interviews and the final thematic analysis. Excerpts from this diary can be found in Appendix 10 – Examples from reflexive diary.

Although researcher subjectivity in RTA could be considered both a resource and a potential bias (Braun and Clarke, 2019), in this case it was actively seen as a study strength and the candidate endeavoured to remain reflexive and open to interpretation. Whether or not a theme was essential to addressing the overall research question and whether it would suitably contribute to real world applicable knowledge was determined by the judgement of the candidate, as discussed by Campbell *et al.* (2021). An audit trail and brief memos were captured by the candidate after each interview, to note initial observations and insights along with potential extracts of interest from the data. These memos, along with further details and evidence of decisions taken, can be found in Appendix 12 – Examples of analysis. The memos helped the candidate to stay true to the data, maintain focus on the research question and ensure implicit biases or understandings were not intertwined heavily within the analysis. Regular dedicated meetings took place with fellow researchers who were familiar with the dataset and study and broader discussions occurred with the wider research team who were not. This gave a range of insight and again helped to maintain focus on the data and the research question whilst providing opportunity for further reflection and checks on reflexivity.

3.10 Chapter summary

This chapter has provided an overview of the philosophical foundations for the study and described focus groups, interviews, WC and collective making as possible data collection methods to answer the research question. The rationale behind choosing semi-structured interviews and mindlines was then explored in more depth. This was followed by an explanation and description of the stakeholder engagement, including patients and the public, in the study. The choice of RTA to analyse the data and the importance of reflexivity were discussed. The next chapter will present the results of the semi-structured interviews.

Chapter Four: Results

4.1 Introduction

This empirical chapter presents the findings from the semi-structured interviews with FCPs, which were analysed using RTA to explore in-depth their attitudes, beliefs and behaviours towards using Twitter as a source of knowledge to inform their clinical practice. The chapter begins by describing the study participants, before giving an overview of the thematic findings followed by a more detailed exploration of the main themes and subthemes with supporting data extracts from the interviews.

4.2 Participants

A total of 19 FCPs consented to take part in semi-structured interviews. Of those contacted by purposive sampling, three were identified through existing IAU networks and five participants were recruited via the study advert on Twitter. Snowball sampling resulted in 11 more participants agreeing to be interviewed; one of these participants learned about the study through being tagged on Twitter by a colleague, and the remaining ten through their own physiotherapy networks. One potential participant did not meet the eligibility criteria and five further potential participants expressed an interest in taking part but did not respond after receiving the study information. All interviews were carried out via MS Teams between November 30th 2021 and February 28th 2022 and lasted between 21:58 and 1:01:42. No participants withdrew from the interviews.

Study participants were based in six different geographical regions of England. Of the participants, 14 were Twitter users and five were non-Twitter users.

Non-Twitter users reported using other social media platforms and two had used Twitter previously but were no longer active on the platform. Ten of the participants were male and nine were female. 16 worked for the NHS (Foundation Trust n=11, Integrated Care Trust n=2, Community MSK service n=2, Clinical Commissioning Group n=1) one worked in private practice and two worked for social enterprise organisations providing NHS community services. All participants worked as FCPs. Four participants also held leadership roles in the NHS (physiotherapy and FCP lead n=3, consultant physiotherapist n=1). At the time of interview, participants had been qualified in physiotherapy for an average of 14 years, ranging from seven to 24 years' experience. Participants had been working in an FCP role from between three months and five years, with the majority (n=16) working in the role for two years or less.

Detailed notes on the characteristics of the participants are included in a table in Appendix 9 – Participant characteristics.

4.3 Thematic findings

In this section, all themes and subthemes are summarised visually in Figure 7: Final thematic map illustrating themes, subthemes and the relationships between them, and outlined in Table 2: Final Themes, Subthemes and Definitions, before being described in more detail with supporting quotes from participants.

Figure 7: Final thematic map illustrating themes, subthemes and the relationships between them

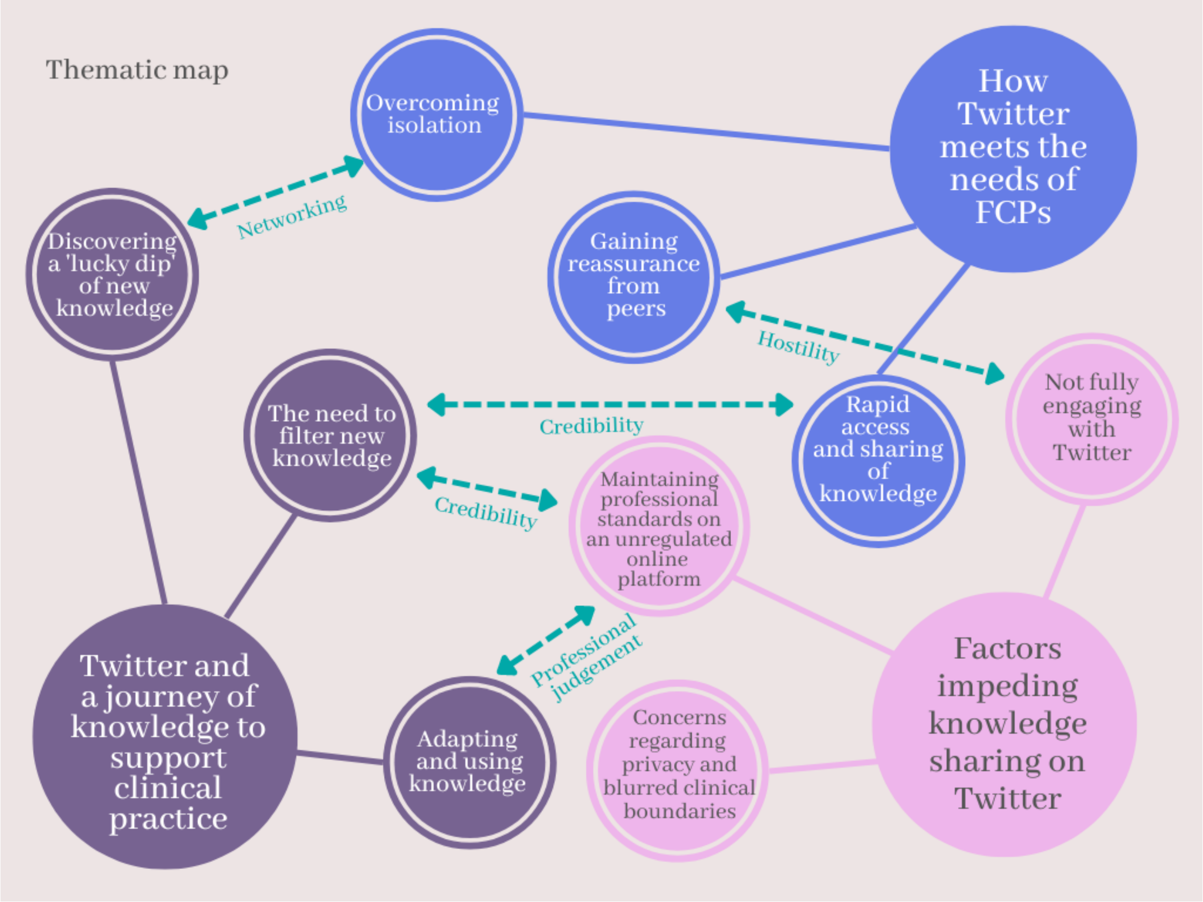


Table 2: Final Themes, Subthemes and Definitions

Themes	Subthemes	Definitions
THEME 1: How Twitter meets the needs of FCPs		This theme looks at the professional needs of FCPs and how Twitter can play a part in addressing these needs
1	*Overcoming isolation*	The ways in which Twitter can connect FCPs to professional peers when working in isolation (sharing networks)
	Rapid access and sharing of knowledge	The ways in which Twitter can rapidly provide easy access to a diverse range of bite-sized knowledge for busy FCPs (sharing knowledge)
	Gaining reassurance from peers	The ways in which Twitter provides validation and reassurance for a newly created professional workforce of FCPs (sharing reassurance)

THEME 2: Twitter and a journey of knowledge to support clinical practice		This theme describes the way FCPs find, appraise, adapt and share knowledge on Twitter to translate knowledge into practice
2	*Discovering a 'lucky dip' of new knowledge*	How FCPs find and engage with new knowledge on Twitter (finding knowledge)
	The need to filter new knowledge	How FCPs filter sources and content on Twitter for credibility (filtering knowledge)
	Adapting and using knowledge	How FCPs adapt and use new knowledge from Twitter for clinical practice and share knowledge through different channels (applying knowledge)
THEME 3: Factors impeding knowledge sharing on Twitter		This theme describes how factors unique to the online space can be detrimental to knowledge sharing
3	*Maintaining professional standards on an unregulated online platform*	The ways in which professional behaviour appears to change on Twitter
	Not fully engaging with Twitter	The ways in which using Twitter passively can prevent knowledge sharing
	Concerns regarding privacy and blurred clinical boundaries	How clinical boundaries differ on Twitter to real life, causing confusion and concerns for privacy

4.3.1 How Twitter meets the needs of First Contact Physiotherapists

This theme looks at the professional needs of FCPs and how Twitter can play a part in addressing these needs

4.3.1.1 Overcoming isolation

Several participants spoke about the nature of their role and how they typically worked as the sole therapist within a busy GP practice behind closed doors:

> *"There are no FCPs on site with me, I'm the only one there […] It's not like you just knock on somebody's door or open the next curtain to have a chat with people, you know it's not like, you don't have that kind of support when, if you're in a department it's different." (P14 T)*

This would often mean a lack of contact not only with fellow FCPs but also with colleagues in the same building, with one participant commenting they had been referred to as a *"visiting clinician" (P16 T)* despite having regular clinic days at the practice. This contrasted with participants' previous roles within busy physiotherapy departments where they were often working alongside other therapists in larger teams. Consequently, for several participants this change in dynamic has resulted in a change in Twitter use:

> *"I didn't use Twitter as much in rheumatology as I do now and I think it's because the more remote you are, I mean, I work on my own in a room." (P06 T)*

All participants had fragmented patterns of working which added to this feeling of detachment; one was in *"seven different places" (P07 T)* as an FCP and others were part time, with the remainder of their working week spent in non-FCP roles and settings such as hospitals. Furthermore, isolated working was exacerbated during the COVID-19 pandemic when many FCPs, new to the role, worked remotely and could not see patients or colleagues in person. COVID-19 contributed to loneliness within the context of FCP:

> *"It's hard, you don't get the same interaction that you would if you were just having a chat with somebody and there's none of that kind of, 'Oh, how's the kids? How's this?' There's none of that normal chit-chat at all. You can feel a bit isolated." (P07 T)*

Participants highlighted how Twitter can potentially address this need to overcome isolation both personally and professionally and find likeminded colleagues. The findings illustrated the need for personal and professional connections with colleagues and participants described how Twitter was a place to *"promote conversation" (P09 T)* amongst colleagues to share best practice. The benefit of using Twitter to share best practice locally, nationally and even internationally was recognised, as was the opportunity to make connections beyond the immediate professional community:

> *"It's also great to collaborate with people so you know sometimes you can contact people in different areas who might be running in-service [training] elsewhere or abroad […] it's really great to hear the sharing of practice across different providers and communities." (P18 T)*

The data highlighted participants' anxieties around constantly changing FCP policies and guidance, in particular *"a lot of unease with the roadmap and the portfolio and changing the goalposts" (P07 T),* which contributed to confusion and intensified the feeling of isolation. Furthermore, participants spoke about limited opportunity for GP mentoring now that the FCP role is no longer in its pilot phase and were concerned about variation in CPD and mentorship going forward:

> *"I speak to a lot of FCP's elsewhere and they're not getting support, not getting mentorship, there's very few supervisors and so on." (P18 T)*

Connections made online therefore centred around being able to learn from others to overcome this anxiety by asking:

> *"'What's the latest evidence on this' or 'What's been released recently?' or 'What discussions have been going on about this?' I find it [Twitter] really useful, really helpful for that." (P05 T)*

In addition to sharing best practice, it was particularly important for participants to use Twitter to share current research for evidence-based care:

> *"It can be so helpful you know, there has been such a knowledge gap for so long about when something gets published and supposedly how long it takes before it kind of trickles through into clinical practice and so, with Twitter you know, you have the ability to get stuff so quickly*

> *and you get different thoughts and opinions on things so quickly." (P13 T)*

The data clearly illustrated that this was because the character limit of tweets conveyed key, succinct clinical and research messages. The strain felt by FCPs (as with other HCPs) struggling to find time to read and use lengthy, complex documents was evident in the data and therefore this bite-sized knowledge was seen as particularly useful for busy FCPs:

> *"I think with Twitter […] they give the kind of pertinent points of a research study or something that's easier to remember, more easily digestible and the kind of key take home messages." (P13 T)*

> *"Very often sometimes I am clutching at straws when I get home and thinking well, I need something quick, I don't want to be spending an hour looking through Athens […] I'm not into that because I'm not going to be doing a hugely clinical trial or anything, I don't want to be doing lit reviews I just want an answer there and then." (P06 T)*

Moreover, Twitter offered an avenue to acquire knowledge hidden behind journal paywalls:

> *"So sometimes, published papers you can't access them, if you're not on either through a university or Athens through whoever you work for then, it can be quite difficult to get certain bits of information so, you do get that kind of easy accessibility of Twitter." (P13 T)*

Although several participants explained the benefits of Twitter for peer-to-peer connection to share best practice and research evidence, conversely one participant pointed out that the shift to online working in response to the COVID-19 pandemic has meant that there is no longer as much of a need to use Twitter for this, as video calls have contributed to making connections with others easier:

> *"I use it a little bit for networking, but currently given the current kind of virtual conference set up at the moment, I don't really find it as useful for that because you're then working through Teams anyway." (P01 T)*

4.3.1.2 Rapid access and sharing of knowledge

The ease and speed that participants could access knowledge via Twitter was reported as vital for quick access to knowledge due to increasing workloads and time demands:

> *"I'm juggling 101 different things so, it's great to be able to pick things up and drop things as I need to." (P06 T)*

Rapid access to current knowledge which could be used in practice was particularly important:

> *"For me it's always like, 'This has been published today, see the link, see the full access to the link on here.' And I think, 'Brilliant, I'll click on that.' That would be what gets me cos I think, 'Right I can easily access that.'" (P07 T)*

> *"How useable it is, so, if it's a piece of research that goes into the minutiae of a very specific condition, that's probably not something […] that I can use on a very regular basis. Or transfer that information clinically very easily. So I wouldn't look at using that an awful lot."*
> *(P01 T)*

Participants were clear that Twitter provides opportunity to bring many different types of knowledge together, allowing them to be able to "*keep on board with lots of things all in one place" (P11 T)* and gather knowledge from many different sources to potentially explore further if relevant:

> *"It might be that you've come across – something is mentioned in that case that you've not come across and you then go and search it or you then go and look around it." (P08 T)*

Alternative sources of evidence-based knowledge for participants included online profession specific journals, such as the CSP 'Physiotherapy' Journal, professional magazines such as the CSP's Frontline magazine, journal articles exchanged between colleagues online and offline, and searching research databases, although this was seen by some participants to be "*old fashioned" (P01 T).*

Being up to date with knowledge that changes quickly was important for participants to stay current with research and clinical guidelines for best patient care:

> *“New NHS England guidelines about MSK came out a couple of days ago so I saw someone retweeted that […] I use it as a tool more to stay in the loop about any developments, or new release of studies”.*
> *(P09 T)*

> *“You are up to date, you are with current thinking and you’re in touch with the current professional issues and that kind of stuff.” (P08 T)*

Several participants described Twitter as a potential platform for sharing this up to date knowledge with patients, as well as their peers:

> *“It could be really helpful to share new information, it could be really helpful to share local resources or things available to those people in that community, so if it was used you know, sort of sensitively then, I think it could be used really, really well.” (P13 T)*

However, the sheer amount of online knowledge can also conversely inhibit knowledge sharing and all participants who used Twitter agreed that they are frequently overwhelmed by information, both online and offline:

> *“I’m sure I don’t see half the stuff that is on there because I’ll spend 20 minutes, half an hour maybe scrolling through and just having a look, but I’m sure there’s loads of stuff that I’ve missed, because I’m not on there all the time.” (P02 T)*

Whilst rapid access to knowledge on Twitter was acknowledged as a positive, there was a growing pressure, accentuated by social media, to not miss any information in this always on culture:

> *"You've got a last minute Teams meeting or a seminar, that's only a couple of days away, rather than wasting your time with an email that people might not see because they're off, you can put a tweet out and they'll get it to their phones instantly". (P01 T)*

When this pressure is combined with increasing demands on their time, participants did not have the capacity to gather and assimilate a range of information on Twitter and engage with it, effectively paralysing their sharing of and engagement with knowledge:

> *"I probably would get more involved if I had a bit more time I think, I just have a very busy job, home life, lifestyle, and I wouldn't post something, just throwaway comments without thinking about it." (P11 T)*

Yet the findings also revealed an underlying fear of missing important knowledge on Twitter, which lead to increased anxiety:

> *"You want to try and keep in touch with some of the resources and things out there and not miss stuff […] Oh God it's like hundreds to look through here and I don't want to miss something so it can create a little bit of, you know, kind of stress." (P18 T)*

Some participants described a perceived expectation to use Twitter and ensure that they are not missing out on important information:

> *"That's just about wanting to be seen to be in the loop, by saying the 'CSP have published this today, what do you think?' or just to say, 'This*

> *is a useful resource, I think you'd find it beneficial.' But I guess talking that through, a lot of that is actually the buzz you get of feeling like you're in the loop. Do you know what I mean? That you're in touch and you're at the forefront of what's being said." (P08 T)*

This fear of missing out was also acknowledged by the non-Twitter users, such as participant 15:

> *"Your APPs and your Advanced Practice, they may be getting loads of information and knowledge through Twitter that actually I could be getting and missing out on, and if that were the case, then I would want to know." (P15 NT)*

Furthermore, participants alluded to a sense of feeling guilty regarding the lack of time that they dedicated to supporting knowledge sharing:

> *"I do feel like I should probably put a bit more time into it and do a bit more reading, because I know that there are a lot of people that are trying to promote quite a lot of really important information on Twitter and I don't feel like I'm giving them the time that they deserve with what they've put on." (P07 T)*

4.3.1.3 Gaining reassurance from colleagues

Participants described using Twitter to get "*the feel of what other people are thinking and saying about different things" (P02 T)*, in order to identify gaps in their knowledge that need addressing through further research or training.

Several looked for affirmation from the Twitter community and drew confidence from this:

> *"It felt like a lot of people were saying and thinking the same things that I was and it was nice to be validated." (P08 T)*

This reassurance was further reinforced by the behaviours of opinion leaders:

> *"With some of the FCP's there's quite a few that are relatively established - a lot of them are advanced practitioners with an awful lot of knowledge and they've usually got some really good information that they give out well, I just, I find that quite interesting. Again, it's something, it gives you a little bit of confidence when you come in and very often I am on the same wavelength, I'm thinking the same things so, it's that reassurance as well." (P06 T)*

Gaining reassurance from others was important to some participants who reported not having sufficient 'status' to reciprocate this reassurance and share their own knowledge and experiences on Twitter. For one participant, this appeared to lead to a belief that endorsement from more popular physiotherapists and opinion leaders would be the only way for they themselves to reassure colleagues:

> *"I think I would probably need to tag some big names so that more people saw it and, and get other people to retweet it and things like that, because I think me on my own probably wouldn't reach very far". (P02 T)*

Participants described the perception that those with a prolific Twitter presence and many followers were often more experienced and senior colleagues, rather than fellow FCPs, with recognition that Twitter is a place where "*a lot of more senior clinicians are getting their information'" (P01 T).*
The data showed that a visible presence of leadership on Twitter was important to participants, with many feeling reassured to see senior staff providing guidance and inspiration online:

> *"It's just that appreciation of academic rigor and criticality like ((names consultant physiotherapist)) […] she just seems like a hardworking, switched-on, kind of everything you want about a healthcare leader. So somebody like her who - you're gonna get stuff that makes you feel professionally buoyant if you like." (P08 T)*

Participants reported following and engaging with a range of people on Twitter for different reasons. One reason consistent with participants who used Twitter is that Twitter provides an opportunity to gain reassurance from colleagues regarding their clinical practice. For example, data illustrated how Twitter could act as a support tool to boost professional confidence, by enabling them to seek colleague support and gain reassurance in their own professional practice:

> *"I think also sometimes it's just really nice for reassurance that actually you think, well, I know that, and I'd have done that and that's what I'd have said, or that's what I'd have done. So there can be that reassurance that you look at a case study [on Twitter] and go you*

> *know, based on what everyone else is saying you think, oh yeah, well I'd have done that. So that's useful in itself I think." (P11 T)*

This reassurance seeking behaviour expanded beyond the purely clinical context and was also seen in the data in relation to wider contextual policy concerns surrounding CPD and the development of the FCP role:

> *"Especially with the Roadmap, you think you want some support you know, you think you want what people are talking about, is it only me that's stressed about it or is everybody thinking the same thing? Or you know is there something that I'm missing out, is there something that I didn't know about? So, it's that kind of support, even though you don't get factual information, it's people talking about things and they're going through the same things like we're going through." (P14 T)*

Conversely, one participant highlighted that instead of reassurance, Twitter can have the opposite effect:

> *"I've come across in a new role professional insecurity because of social media. Because rather than making people see the positive of 'Well I can go and get that information if I want to', they're kind of like 'Well I've seen this, this and this and I'm not up to date and I'm not managing this appropriately' or 'I haven't seen this guideline' or 'I haven't done this mapping exercise.'" (P08 T)*

4.3.2 Twitter and a journey of knowledge to support clinical practice

This theme describes the way FCPs find, appraise, adapt and share knowledge on Twitter to translate knowledge into practice. In this sense, FCP Twitter users embark on a ‘knowledge journey’.

4.3.2.1 Discovering a ‘lucky dip’ of new knowledge

Many of the participants who used Twitter described how they did not purposefully go on to the platform to look for specific information regarding their clinical practice. Instead, participants had a more casual attitude towards their use of the social media platform, tending to scroll through their feeds with an open mind as to what they may find:

> *“There’s loads of stuff isn’t there? I think it’s quite nice to see. There would be things that pop up that you would never have looked for and some of it is really interesting.” (P07 T)*

Casual scrolling on Twitter reportedly offered an opportunity to discover new knowledge around research evidence, clinical scenarios and imaging, guidelines, training opportunities and service developments all in one place. Many participants also described casual scrolling as a way of discovering new opinions from people from a range of multi-disciplinary professional backgrounds and through new networks and contacts. This added to many of the participants’ broad clinical knowledge base to support holistic patient care and was therefore perceived by some to be a positive way of using the platform. These factors were suggested motivators for participants engaging with the platform:

> *"An example would've been that I don't think I'd have known about the chronic fatigue NICE guidelines coming out if I hadn't have seen somebody share that on Twitter." (P16 T)*

The need to draw upon knowledge from a range of sources was reflected in the way participants expressed a sense of excitement when they discovered new knowledge on Twitter that was deemed useful for clinical practice:

> *"There's one person, she was saying oh and I picked up this in the FCP clinic today and I wouldn't know where to start and that was quite good because it helped to structure me. I don't need to know the ins and outs, I just need to know what it is, what are the features? Is it a CKS? [Clinical Knowledge Summary] Because I have to use that quickly in clinic all the time." (P06 T)*

The platform was perceived by participants to be a complimentary source of information, providing a springboard for further exploration into new areas of learning and was not their sole source of information. In this respect, as much or as little time as necessary could be devoted to using it:

> *"I give it sort of five or ten minutes and then I've got a bit bored kind of doing it and I think I feel like I've done it." (P07 T)*

Conversely, participants also expressed concerns around losing time when casually or 'mindlessly' scrolling through Twitter and that this could have a detrimental or anxiety provoking response. Although one participant spoke about a colleague who had *"designated Twitter time" (P16 T)* scheduled into her working day as part of her national role to overcome this behaviour of 'mindless' scrolling, several participants compared their experiences of discovering knowledge on Twitter to falling down a rabbit hole and needing to be mindful of this:

> *"I think you could get sucked down the rabbit hole of just endlessly scrolling and how much use would that actually be?" (P02 T)*

There was a sense of opening up the floodgates amongst the participants who used Twitter, with several participants discussing anxieties around *"not really having any control over what I get shown unless I search something specifically" (P13 T).* This was not just centred around discovery of knowledge, but also around the discovery of new people to follow and connect with, which was conceptualised by one participant as "*a bit of a chain really" (P09).* Furthermore, the majority of participants followed people on Twitter because other people did:

> *"Lots of people I've followed have been because other people have followed them and I've seen discussion or things being posted […] like when you can see retweets and you think well I don't know who this person is, but it looks like they have similar interests, they're involved in this area and they seem to be posting things that I would like to look at so I'll follow them." (P02 T)*

The format and appearance of tweets had an effect on whether participants would stop scrolling and engage. For example, participants described their preference for tweets containing pre-packaged reliable content, graphics and simple concise messages which were of use for clinical practice:

> *"The ones that I really like are ones that have a little picture or graphic attached to it […] things that you can pass onto patients as well so, patient friendly information, there's a few things that you can just print off and put in the clinic room and bits like that and that's really helpful." (P13 T)*

> *"Information that's easily digestible, they give the pertinent points of a research study or something that's easier to remember and the key take home messages." (P13 T)*

> *"So really nice sort of pieces of work that people have done that saves you kind of re-inventing the wheel doing it again so that's really helpful." (P11 T)*

Interestingly, several participants described wanting to see 'everyday' patient cases shared on Twitter, not just rare conditions:

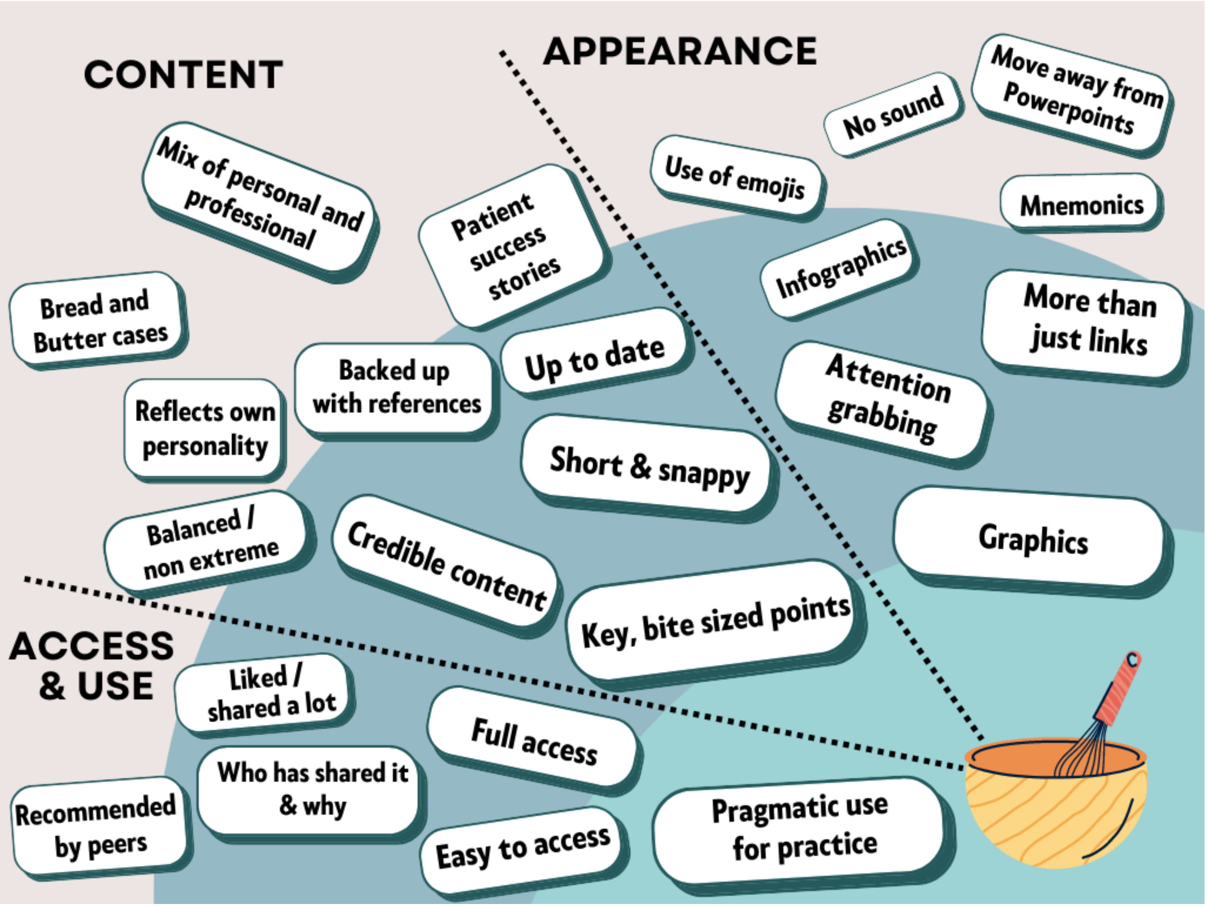
> *"To me I feel the sexy stuff gets attention […] And probably for the majority of clinicians […] the bread and butter is the things that we need to be doing better. And unfortunately that's where the mishaps are happening and most common errors." (P12 T)*

One participant described emojis as an immediate graphical hint as to the tone and content of the tweet:

> *"And some people put like an emoji with it with like open eyes, you know that kind of stuff. And I'm like oh yeah right why has that made them think that is interesting so yeah sometimes the information that comes with it can be useful." (P18 T)*

The key ingredients for a tweet discussed by participants are summarised in Figure 8: Key tweet ingredients. The ingredients closest to the mixing bowl were more commonly mentioned by participants.

Figure 8: Key tweet ingredients



4.3.2.2 The need to filter new knowledge

Once knowledge was 'discovered,' participants spoke about the need to filter it before it could be used in a practical way. Participants were aware of the need to filter both content (tweets) and sources (people posting) on Twitter, but this was not done systematically or routinely:

> *"I'd love to say that I went back and kind of read through all of the individual research papers and checked everything and things but, I don't." (P13 T)*

Some participants reported endeavouring to do this where possible, searching for and prioritising trusted, balanced sources, evaluating the content, context and relevance of a tweet, and appraising information using clinical judgement and decision making skills.

All participants who used Twitter described an awareness of the potential for misinformation and discussed the need to judge whether or not the content of a tweet was credible, which then had a subsequent impact on whether or not they engaged with the tweet. Several participants described appraising and evaluating the information in tweets by looking for the evidence to support it:

> *"Similar to fake news, you have to find three or four things that you can identify the source from and that are good quality evidence." (P12 T)*

In fact, maintaining a critical eye on the credibility of tweets was considered to be just as important as critically appraising research evidence:

> *"Quite often it's linking you to guidelines or papers. That said, I do understand that even when you're reading a journal you've got to read that with a critical eye." (P16 T)*

Whilst many participants acknowledged how discussion and debate on Twitter was informative, one participant described how they avoided personal opinions and filtered information on Twitter solely for research articles:

> *"When I think about credible, I would more look at the research side of things, if there's an article to put in there then I'll look into that. It's like I said before they're talking about debating and arguing one thing over the other, I tend to stay away from those discussions. Because personal experiences or personal opinions which they're free to share it on social media but I don't really need to know about it." (P14 T)*

The exception to this however, was if debate and discussion were backed up with research evidence:

> *"If it's backed up by good resources […] aligned to a good evidence base [...] then you've put three or four papers after it that kind of support your arguments. So to me that gives it more credibility".*
> *(P18 T)*

Interestingly, one participant talked about comments on tweets acting as a mini evaluation and appraisal system, highlighting that consideration of the reliability of knowledge could continue once the tweet starts to be commented on:

> *"You often get plenty of comments attached with the articles, which people have put out there. So you've already got almost got a bit of a critical appraisal when you're there, people giving their comments on what's good, what's not so good, how robust the study is, and then you have the opportunity to look through it for yourself." (P01 T)*

A further non-Twitter user participant took this one step further, talking about the idea that when knowledge moves from social media platform to social media platform and is talked about elsewhere, it becomes more refined and robust, reflecting evaluation processes offline:

> *"Which is why I think if it's filtered through and then becomes enough of a thing to be talked about on other platforms I would give it more credibility." (P03 NT)*

In contrast to this, participants acknowledged that this constant filtering and movement of knowledge could result in knowledge nuances being lost and knowledge being 'diluted':

> *"Let's have a webinar of an evening talking about FCP and invited people from HEE and clinicians and so on to talk about their experience. It was great, and it just helps to dispel some of the kind of misconceptions I suppose that get diluted as it goes through conversations and chats on social media." (P19 NT)*

One participant acknowledged that if knowledge is not actively filtered, there is a danger of acquiring knowledge that is not credible via Twitter, but highlighted this is a danger in person as well as online:

> *"[There is a danger of] information on Twitter informing my practice when perhaps there's not the valid kind of evidence or clinical reasoning behind it, perhaps without me even realising that that's happened. But I guess that can happen within clinical practice. At work somebody could say something couldn't they and you take that on-board, but it's not actually true." (P16 T)*

In terms of sources, many participants were aware of, but did not subscribe to, a belief that the more followers a person had on Twitter, the more credible the content of their tweets were considered to be:

> *"I think, you know, perhaps someone having lots of followers, some people might think that might mean that they're more likely to spread helpful information." (P13 T)*

The data showed a concern around the cyclical nature of being popular on Twitter impacting on the influence and power that someone may have, with more popular people seemingly having "*a lot of clout on Twitter" (P01 T).* Comments from Twitter followers can reinforce this belief:

> *"All they do is blow the smoke up someone's arse and make them feel that they're more right about what they say with the more people that follow them or look at it, whereas that's not true." (P10 T)*

Sources that were considered to be credible or trustworthy on Twitter were professional, respected national bodies such as the CSP, academia or the NHS. Many participants believed that tweets from these accounts were automatically reliable because an appraisal process had already been conducted:

> *"The national bodies are pretty robust because a lot of that has already been filtered, so I'm aware that's already been reviewed before it's been put out so that's pretty trustworthy." (P01 T)*

> *"Sometimes you kind of think has there been any scrutiny of what's been posted here, but it's come from an academic institution, it must be okay." (P08 T)*

Some participants described concern regarding the role that social influencers play and whether this had the potential to impact on physiotherapy practice:

> *"There's loads of people on there that you think 'I don't know where your background is or how experienced you are or are you even a physio?' [..] are they being paid by a company to promote a certain thing? So like the drug rep companies or different types of taping or whatever. Is it ethically-based while they're promoting these things or is it because it's a sponsored ad?" (P07 T)*

All these statements were largely discussed with the caveat that making their own decisions around credibility was important, and whether or not to use knowledge in their own practice was not simply down to the popularity of the knowledge sharer:

> *"If I trust what's going on, and I believe from my own clinical reasoning and other sources, that it's something worth agreeing with, then I will take it on board." (P01 T)*

When filtering knowledge, many of the participants spoke about being aware of potential bias online. One participant described concern that shorter tweets may introduce bias:

> *"I think as long as you're aware of the bias in how that's presented in a very short – I don't know what the word limit is on Twitter now – but as long as you're aware of the potential biases to that information those things can be really helpful." (P08 T)*

However, the most common concern centred around influential physiotherapy peers and the risk of bias within small online professional communities which could act as echo chambers (defined as the same ideas and opinions repeated without consideration of competing thoughts, reinforcing the same beliefs and encouraging bias). Some participants felt that as FCPs often work on their own, echo chambers could have a negative impact on their practice:

> *"There is a big risk as clinicians as we develop to one school of thought because we follow the people we agree with only. And then we end up*

> *causing, not harm but possibly missing out on a lot of good information." (P12 T)*

> *"But I think, you know, with social media I think it can be really dangerous, can't it? […] because if you're not exposed to certain things, not exposed to certain ideas […] you risk not getting other knowledge about different areas […] having those sorts of discussions is still really, really important because attending conferences you just get a much broader idea of where we're at rather than perhaps get a corner, a very small subsection of Twitter." (P13 T)*

Many were not aware of the algorithms used by Twitter, but described their consequences as reasons for leaving the platform altogether:

> *"I was finding that I was following three or four people that I'd been recommended to follow and then almost only seeing their point of view on things." (P03 NT)*

In contrast, others felt that echo chambers and bias could be overcome, through the *"open forum" (P07 T)* nature of Twitter stimulating discussions and debates and by seeing a "*different snapshot now that I've sort of purposely followed people" (P05 T)* who are outside usual circles. Additionally, some felt that the huge volume of information on Twitter reduced the risk of bias and echo chambers:

> *“Articles tend to go quite cyclical and through various different people, I think it’s a pretty small chance that you’re going to miss anything major.” (P01 T)*

Additionally, one participant described trusting clinical FCP peers on Twitter over those not working clinically in the role:

> *“I would always trust somebody who is actually doing the job, over the people who maybe are the creators or the higher ups, who don’t necessarily do the actual clinical work, but have had an awful lot of say in the literature in the construction of it.” (P01 T)*

4.3.2.3 Adapting and using knowledge

The data showed that once knowledge is 'discovered' on Twitter and then ‘filtered’, it is then adapted for use and mobilised in different ways and through different channels. The mobilisation of explicit, complex knowledge, such as guidelines, were often seen to need to be adapted for everyday use and combined with *“the other bits beyond MSK that you need in this role” (P09 T),* namely the tacit understandings of local processes and environments. An example of this was where one participant had used an article and clinical guide identified on Twitter regarding serious pathology, to inform a departmental in service training session. This enabled staff to compare pathways identified in the articles with local clinical pathways. Participants described how they shared knowledge from Twitter with their teams, finding ways to adapt and summarise key findings or resources:

> *"Often the stuff I pull off I then share with the team […] So for example when the MSK standards came out the other week, the first place I saw them was on Twitter. So I read them, summarised them, put a little PowerPoint presentation together for the whole service and said, look it's 72 pages, I don't anticipate everyone's going to spend time reading 72 pages of this document but these are the key points."*
> *(P18 T)*

The non-Twitter users interacted with knowledge on other social media platforms in similar ways to Twitter:

> *"Someone shared something on LinkedIn […] A4 sheet that kind of summarised everything we talked about for three hours. So I immediately saved that, printed it off and I use it on a daily basis just a summary if you're thinking this, this is what tests you ask for. And that came from a form of social media post from you know the rheumatology department somewhere or something like that."*
> *(P03 NT)*

Direct use of empirical knowledge, for example research findings, were also treated similarly and adapted for ongoing sharing through emails, WhatsApp groups, in person team meetings or CPD sessions.

> *"There are articles that people will post on Twitter, especially new articles as they're published, and if that catches my eye and I think oh that looks a good article, often that will then form the basis of an in-*

> *service training that we do or I'll email it just to colleagues in the team and vice-versa." (P11 T)*

Many participants discussed seeing clinical case studies posted and discussed on Twitter, describing that these widened *"clinical reasoning in terms of differential diagnosis" (P16 T)* and enhanced conceptual understanding of multiple clinical conditions:

> *"You have a lot of case studies out there, people's patient experience, so for example in FCP, there's quite a few people that will put tweets out going right, I've had x y and z as a case study, give a clinical scenario, would you look at bloods in this situation, would you look at imagery, and it can start quite a useful clinical conversation in that regard." (P01 T)*

Both examples demonstrate participants combining knowledge gleaned from Twitter with their own experiential and tacit knowledge, and adapting it into their own contexts and for their own purposes in clinical practice or ongoing learning.

4.3.3 Factors impeding knowledge sharing on Twitter

This theme describes how factors unique to the online space can be detrimental to knowledge sharing.

4.3.3.1 Maintaining professional standards on an unregulated online platform

A common cause for concern for many participants who used Twitter was witnessing what they perceived as unprofessional behaviour in the Twitter physiotherapy community. (It is important to note here that none of the participants mentioned a specific FCP Twitter community, instead participants tended to follow physiotherapists, some of whom were FCPs). Examples given of unprofessional behaviour included *"heated arguments and swearing" (P02 T), "personal judgements" (P19 NT) and "inflammatory comments" (P16 T).* These behaviours resulted in a common belief described by one participant as "*an issue with professionalism on Twitter"* which *"really concerned" them (P12 T).*

Accounts of unprofessional behaviour described included instances whereby a difference of opinion was expressed harshly, public disagreements escalated or where individuals were singled out and disparaged by other Twitter users (who were described as physiotherapists with a lot of followers). Although no participants reported this behaviour being directly targeted at them, all participants who used Twitter spoke about their experiences of witnessing online arguments between physiotherapy colleagues on Twitter. Participants described their view as to how the online behaviour of others was detrimental to the profession:

> *"You might rant to a friend and swear your head off but in a professional context you would never do that. But Twitter is this kind of half way between the two and so I think sometimes it goes a bit too*

> *far into the personal opinions and how you would behave when no-one else is watching, but everyone's watching." (P02 T)*

This behaviour provoked a feeling of sadness and professional embarrassment for participants, who felt that the environment could be *"toxic" (P08 T, P02 T, P18 T)* and that some people behaved differently online to how they would in person:

> *"You wouldn't behave like that in person. You wouldn't – if, if you're at a conference or you're around a table, that just wouldn't – that behaviour wouldn't occur and you wouldn't speak that way and so I just don't see a need to engage with that." (P19 NT)*

Reasons included *"hiding behind their login, so they can say what they want" (P07 T)* and getting lost behind anonymity and online personas:

> *"I don't know, there's a phrase called keyboard warrior isn't there […] people are not in front of anybody and can feel like they can express their opinion. And great, I'm all for freedom of opinion and so on but I think it has to be done respectfully […] Some people they may have different values I don't know, maybe it's just frustrations coming out and they feel they can air it on there because they're not at work or in that environment." (P18 T)*

This concern regarding a lack of respect online in professional circles was echoed across the dataset, with one participant highlighting that although "*to* *be exciting and different you have to be extreme*" (P08 T), this could also be preventing knowledge sharing:

> *"We don't value knowledge in the way that we used to and we don't value age or respect age or experience in the way that we used to as a society and that's reflected in our use of social media." (P08 T)*

One non-Twitter participant shared their previous experiences of frequently observing what they perceived to be aggressive Twitter posts from a physiotherapist who disagreed with the opinion of others:

> *"Whereas ((names physiotherapist)), from my point of view, is bashing them saying, research doesn't suggest this works or that. But he doesn't really share any of his case studies of you know he's just bashing this guy because he does something which is a bit different." (P17 NT)*

Yet all participants were aware of the importance of maintaining professional standards on Twitter, and spoke about a responsibility when posting clinical content in an online space to not give clinical advice. They actively endeavoured to adhere to professional standards if they chose to engage with the platform in any way:

> *"If it's a private account and you're chatting with your friends and fooling around, it's probably not going to be good image on your FCP image. So yeah we've got to be judicious of how we are presenting ourselves in public media." (P14 T)*

> *"I don't see the point of just putting random comments. I feel like it needs to be a structured post." (P07 T)*

Although acknowledging that *"free speech is important" (P02 T),* participants suggested ways in which professional behaviour needed to be *"regulated"* and *"policed" (P01 T).* One participant indicated that training on how to use social media may be beneficial to overcome some of these behavioural challenges:

> *"We've definitely never had any kind of [training] in the Trusts that I have worked in […] I've never attended a training where we've talked about social media, how to use it or which is really interesting actually because yeah, but you know, it can be used in lots of ways, can't it? So, I do think that would be good, I think that would be really interesting." (P13 T)*

Several participants suggested incorporating social media education into undergraduate and postgraduate courses. This was because they were concerned for younger and newly qualified colleagues being adversely influenced by unprofessional behaviour that they may see on Twitter:

> *"I sometimes worry about kind of younger or newer clinicians going onto Twitter or going onto Instagram looking at the first thing that they read and thinking, 'Oh, that's how I am going to practice, I believe that. That's you know, absolutely what I am going to do' but it's not really gone through that research process, it's just someone sharing their thoughts and opinions, it's not evidence-based and they're taking that perhaps at face value." (P13 T)*

4.3.3.2 Not fully engaging with Twitter

Whilst some participants reported directly witnessing hostilities within the Twitter MSK community and others described a more general perception that the platform fosters a negative environment, the outcome was that they tended not to fully engage with the platform. This resulted in the potential for stifled knowledge sharing and knowledge growth:

> *"There's no value to me or the argument by me sticking my head up above the parapet. So I stay below it these days." (P10 T)*

Several non-Twitter users described the negativities outlined in this subtheme as reasons for leaving the platform, with the potential for hostilities being their main driver for discontinuing their Twitter account. For the Twitter users, those who had directly witnessed hostile exchanges on Twitter described subsequent anxieties around sharing knowledge themselves. These anxieties ranged from a fear of being judged by others to being verbally attacked:

> *"You're doing something, or managing a service a certain way, or behaving in a certain way with your patients, and somebody disagrees, it can be quite a volatile place." (P01 T)*

> *"If you give your opinion on Twitter in a MSK world, it seems that you get hauled across the coals for having an opinion that happens to be different from someone else's." (P10 T)*

Furthermore, reading unprofessional tweets tended to result in participants not wanting to post themselves at all, as they were aware of the public nature of the forum:

> *"You wouldn't be doing that if you were in a clinical environment so why are you doing it on here when that's open for the world to see." (P18 T)*

This led to some participants preferring to use the more private direct message (DM) function over public tweeting. Participants explained that this could be beneficial for connecting with FCPs in other areas of the UK, for example to learn more about new programmes of work, and share experiences and best practice.

Across the dataset, participants were intimidated by this potential for unconstructive arguments which resulted in a lack of confidence when using the platform:

> *"I think with Twitter you have got to be a little bit careful because there's an awful lot of people who tend to knock you down and I don't tend to need that, I mean, I forget with my age, I tend to forget like I can't even remember this terminology for this condition [….] and it just, it's a little bit intimidating really from that point of view." (P06 T)*

Despite being experienced and knowledgeable HCPs, these fears described by participants resulted in them avoiding giving their own thoughts and experiences on Twitter and not actively engaging with online content or communities, preferring instead to *"stay out of it" (P07 T)*. The majority of participants felt more comfortable simply taking knowledge from Twitter instead; staying in the background and accessing knowledge vicariously, describing this behaviour as ‘lurking’:

> *“No I just observe, it sounds creepy when you say it like that, I am a lurker in the background yeah definitely. I will sort of tweet the occasional things but not that much in comparison when you read other people’s Twitter and things. It’s more I will retweet stuff but I’m directly retweeting it, I don’t tend to add anything to it, or I’ll like it or that’s kind of my engagement rather than proactively posting something.” (P09 T)*

> *“Just a horrible voyeur. It’s all about me getting ‘whatever I can get from Twitter’ rather than contributing to it. It’s a terrible thing to admit I suppose.” (P08 T)*

> *“I tend to be quite quiet on there, I don’t have a lot of people following, I don’t do a lot of Tweeting, I do a lot of looking and seeing.” (P06 T)*

In fact, lurking was the most reported Twitter behaviour by participants and the reasons behind this behaviour are multifaceted. For many, this is because they feared hostile repercussions or making a mistake:

> *“I don’t post anything mainly because I’m not going to say the wrong thing and get loads of abuse, I’ll just quietly lurk and look at what other people say.” (P02 T)*

> *"I tend to use it more to read it, rather than post on it if that makes sense. I think that's probably because you never really kind of get taught about consent issues, and you don't want to get in trouble. And that's kind of a bit of a barrier to me, so I tend to use it more as a resource, than to share anything from me personally if that makes sense, or clinically." (P09 T)*

One reason described for participants' lurking behaviour was a lack of time for FCPs to actively share knowledge via Twitter:

> *"If I were not juggling quite so many plates in all aspects of my life, I'd probably be a little bit more visible. I feel like I take more than I give at the moment […] but I think I see that in the next five years when the work-life balance is a little bit easier and I'm not doing Masters modules, perhaps it might play a bit more of a role in that respect." (P16 T)*

Interestingly, several participants described conflicting perceptions and behaviours regarding their use of Twitter, discussing both the advantages and challenges of the platform. Many had positive attitudes towards the benefits of active engagement on Twitter, yet avoided posting and sharing information in favour of taking information instead:

> *"I've found actually it was really useful for people flagging up things that are new." (P10 T) / "Ultimately I don't like social media. I think it should be called unsocial media." (P10 T)*

> *"I tend to just lurk in the background and see what other people say, I think if you put more effort in to actually connecting with people, then it probably would be a good way to network." (P02 T)*

One participant described running a Twitter handle on behalf of a service, which they used to regularly and systematically post updates. By not using their own name on this organisation account, they described how it was easier to post more explicit information such as service updates, rather than more nuanced knowledge such as opinions or critiques:

> *"I also use it quite effectively because I run the service's Twitter handle as well. So our ((name of local MSK service)) I look after that as well, so it's quite good in terms of advertising and promoting our own service and our own events, and so I engage quite a bit with it via that as well." (P01 T)*

The same participant was also confident in making proactive requests for learning on Twitter on their personal account, actively contributing information to the Twitter community by using the platform to ask clinical questions, the answers from which directly informed how they practiced:

> *"I've put a question out there, tagged on like maybe some rheumatology specialist physios that I'm aware of, or some rheumatologists that I know, tagged them in and got a really useful response and that's impacted on what bloods I've sent them for, whether I've sent them to rheumatology or not in some cases as well." (P01 T)*

> *"You can glean a lot of that knowledge from them and it really streamlines your clinical reasoning. So you don't have to go searching for things quite so much, you can just chuck a question out there and very quickly get a good answer." (P01 T)*

Knowledge gleaned from Twitter, whether this be proactively or by more passive scrolling behaviours, was used actively offline to inform clinical practice by the majority of participants. Furthermore, observing discussions of Twitter influenced face-to-face interaction with local HCPs and patients, contributing to contextual, tacit understanding and *"facilitating good conversations with teams"* (P13 T):

> *"I think it's good to know what the conversations being had are and perhaps what the kind of arguments both sides are [on Twitter] but I think ultimately it's more helpful to have the discussion with the colleagues and people that you're working with and also, the population that you're working with to see what's going to work best for your team, what's going to work best for the population that you serve." (P13 T)*

4.3.3.3 Concerns regarding privacy and blurred clinical boundaries

This subtheme describes how clinical boundaries differ in the virtual world compared to the physical world. Day-to-day in person contexts may not align with virtual ones, causing confusion and inhibiting knowledge sharing. Control of professional and patient boundaries are more challenging in the 'messy' online environment than offline.

The clear boundaries which traditionally exist around clinical contact with patients have shifted on Twitter, which as a public forum now allows patients direct access to their HCP. The majority of participants expressed concern that patients would be able to contact them 24/7 and outside of work hours:

> *"That's my time. I don't want you impinging, I will see you in my clinic when it's your appointment, but I don't want you having access, to be in my thoughts and what I'm doing when I'm not at work. Because that's not the deal." (P02 T)*

Participants described a need to keep personal and professional lives apart and wanted to keep boundaries in place so the two remained separate. If patients had contacted them online there was clear concern that these boundaries had been breached and control over this lost:

> *"Because I am quite boundaried with work and home life it did make me feel a bit uncomfortable at the time. I was like, 'Oh gosh, that's a bit strange. How have they found me?'" (P16 T)*

A further concern raised was around privacy and personal scrutiny as a result of sharing personal information in a public forum. One participant described a prior incident in which a patient had used an image from social media of her and her family as his screensaver and how this had directly affected the way she uses Twitter:

> *"I'm not really active at putting stuff on [Twitter], from a security point of view. But I do say this to staff, cos they put all their family*

> *information, their kids, their full name, you can see their house. It is really easy for people to be found then." (P07 T)*

Some participants described concerns around receiving negative comments or complaints from patients on Twitter:

> *"You've always got the risk there of feedback from patients if they've had a poor experience for example, or they might not be overly happy with the service or with your own care." (P01 T)*

In contrast to the majority, only one participant described a positive experience of engaging with patients on Twitter, although maintaining professional boundaries in this situation was also acknowledged:

> *"I have been contacted by patients in the past on Twitter who've just got in touch and said look yeah there's been a flare up of symptoms or just to let you know I'm doing great. I had a lady not so long back who was, she'd wanted to run a half marathon and I discharged her six months, she'd got a training programme, she just contacted me on Twitter to say she'd done it and that's great, you know really good [...] And I was like, that's so lovely, but equally you know that's nice which was welcome but again we just have to be aware of those boundaries a little bit as well." (P18 T)*

Others felt more comfortable if they used their accounts for purely professional reasons:

> *"I don't post anything personal on Twitter so if everything I'm posting on there is professional then I don't see why they [patients] couldn't [follow me]. […] Our GP surgery posts things that their patients might be interested in knowing to do with the surgery […] so if I thought patients were following me then I might be more likely to re-tweet those." (P11 T)*

4.4 Chapter summary

This chapter has presented the characteristics of study participants, followed by an in-depth illustration of the empirical findings, supported by interview extracts. The next chapter will discuss these findings in relation to the existing literature and explore the data through the lens of mindlines.

Chapter Five: Discussion

5.1 Introduction

This final chapter presents a recap of the research question, aim and study objectives. The key findings from this study are summarised, before being contextualised within existing literature. The chapter then goes on to discuss the strengths and limitations of the study, before exploring recommendations for FCP policy and clinical practice, KM practice, and future research. This is followed by the study conclusions.

5.2 Summary of the research question, aim, objectives and key findings

This is the first study to ask the question: “What are the attitudes, beliefs and behaviours of MSK FCPs about using Twitter as a source of knowledge to inform clinical practice?” The overarching aim of the study was to develop new insight around if, how and why Twitter can be used to mobilise knowledge to inform FCP clinical practice. The research aim was addressed by the completion of four detailed objectives which were achieved through semi-structured qualitative interviews with FCPs. The four objectives of the thesis were:

1. To explore the perceptions and experiences of FCPs about how knowledge accessed via Twitter is used in clinical practice
2. To understand how Twitter may (or may not) be used by FCPs to access knowledge for clinical practice and the factors that influence its use
3. To determine what type of tweet format best communicates knowledge to FCPs

4. To provide Knowledge Mobilisers with deeper insight and understanding on effective translation of research to FCP practice via Twitter

The social media revolution has seen huge shifts in the way people create, consume and share knowledge across their personal and professional lives (Baccarella *et al.*, 2018) and it now plays an increasingly significant role in KM and research based relationships (Phipps, Jensen and Myers, 2012). This novel study was the first to bring together KM and Twitter in the context of First Contact Physiotherapy and illustrated how FCPs used Twitter as a source of knowledge to inform their clinical practice. This study is important because, despite caveats and caution, it illustrates the benefits of Twitter as a potential source of knowledge for clinical FCP practice and provides insight for Knowledge Mobilisers and Knowledge Brokers on how to best communicate knowledge to FCPs on Twitter. In addition, this study has contributed to the theoretical literature by illustrating the role that Twitter can play in KM, in particular the enhancement of FCP mindlines. Three key findings were identified:

Sharing knowledge on Twitter depends on confidence: Despite their clinical expertise and experience, most FCPs who used Twitter did not feel confident, safe or credible enough to share their own knowledge and opinions online. By observing unprofessional and hostile behaviour on Twitter, FCPs believed they would encounter intimidation and hateful comments if they contributed themselves. Instead, FCPs were happy to take knowledge from Twitter and adapt and use it in different contexts and communities offline, feeling comfortable sharing knowledge in team meetings or with colleagues in person. As a source of knowledge, Twitter can influence the formation of individual and collective clinical mindlines. Knowledge Mobilisers need to be aware however, that a hostile environment on Twitter may not be conducive to FCP knowledge sharing as mindlines need safe spaces to develop. Face-to-face group discussion and sense making is therefore also needed.

The functionality of Twitter gives rapid access to diverse sources of knowledge: Twitter enables FCPs to have rapid access to a breadth and depth of succinct, up-to-date knowledge to inform their clinical practice which would take too long to find via traditional search methods. FCPs feel that Twitter is useful as a complementary knowledge source within their busy, highly pressurised contexts, yet the volume of information on Twitter and the fear of missing something leaves them feeling anxious. FCPs are concerned about the risk of misinformation on Twitter, and hence filter knowledge found on the platform for credibility. Twitter resembles the insertion of knowledge into individual and collective mindlines in face-to-face contexts. However, there is a risk of misinformation from Twitter becoming a part of FCP mindlines and Knowledge Mobilisers have a role to play in supporting online credibility and nurturing trusted relationships.

Connection is important on Twitter: FCPs use Twitter to engage with peers, researchers and opinion leaders to feel supported and less professionally isolated. Twitter acts as an ‘online coffee room’, in which FCPs can feel reassured and validated by others regarding clinical, policy and role concerns, helping them to navigate significant professional contextual changes and competing demands. Connecting with others is particularly important for mindline development and Knowledge Mobilisers can support this by facilitating networking and developing an FCP Twitter community.

These novel findings are now discussed below with reference to existing literature and theory.

5.3 Comparison of key findings with the literature

5.3.1 Sharing knowledge on Twitter depends on confidence

FCPs feel more confident sharing knowledge in person than on Twitter

A key finding for this thesis was that FCPs who used Twitter did not feel confident enough to actively share knowledge and opinions online, despite being experienced and advanced HCPs. Instead, they described taking pertinent information they had found on Twitter offline, adapting it to their own local context and brokering it in face-to-face CPD sessions and team meetings, where it was discussed, combined with other forms of knowledge and transformed into something useful for practice. This behaviour is consistent with findings from Cranefield, Yoong and Huff (2015), who determined that social media users who do not actively engage online are often active offline or on different platforms. These users actively broker knowledge gained from the social media platform into face-to-face contexts with colleagues, despite passive participation elsewhere.

The key finding from this study around most of the FCP Twitter users not actively contributing to or sharing knowledge on Twitter corroborates estimates that this type of passive social media behaviour is evident in up to 90 percent of users in online communities (Muller, 2012). Findings from Rolls *et al.* (2016) align with this study, as they showed most members of HCP virtual communities demonstrate low posting and more frequent reading behaviours. This passive behaviour is known as 'lurking' in social media literature and has been described extensively elsewhere (Cranefield, Yoong and Huff, 2015; Gong, Lim and Zhu, 2015; Popovac and Fullwood, 2018). Lurking is defined as the passive use of social media in which a user observes but does not take part (Cranefield, Yoong and Huff, 2015; Popovac and Fullwood, 2018), tending to take rather than contribute knowledge (Gong, Lim and Zhu, 2015). The reluctance of FCPs to share thoughts and knowledge on Twitter contradicts findings from Whiting and Williams (2013), which showed that people use social media and feel gratification in 'expressing opinions' online. As observed in a realist review by Zhao *et al*. (2022), passive FCP social media behaviour described in this thesis could be explained by the open and unregulated nature of Twitter acting as a barrier for sharing insights in a non-private community.

This study found that FCPs believe lurking to be a negative behaviour, aligning to social media literature which maintains online communities need diverse opinion and ongoing participation to survive (Cranefield, Yoong and Huff, 2015; Popovac and Fullwood, 2018). Indeed, it would be easy to conclude that a lack of proactive use of Twitter could hinder FCP knowledge sharing, however lurkers are actually an important peripheral part of online communities (Popovac and Fullwood, 2018) and even by simply following prominent Twitter accounts, HCPs have access to a range of ideas that they would not usually encounter in isolation (Thoma *et al.*, 2018) and which could influence offline discussion and learning. Furthermore, comparisons can be drawn between this reported lack of confidence and lurking behaviour and Legitimate Peripheral Participation (Lave and Wenger, 1991), a community learning process whereby participation is at first legitimately peripheral but then increases gradually in engagement and complexity as skills and knowledge grow.

Unprofessionalism and privacy concerns fuel a reluctance to share knowledge on Twitter

This study found that FCPs held the belief that that they would encounter intimidation and hostility if they contributed on Twitter themselves, which is a likely reason for frequent lurking behaviour. This finding is consistent with the broader social media literature, which highlights threat, defamation, abuse and intimidation as potential risks when using platforms such as Twitter (Baccarella *et al.*, 2018). FCPs felt anxious and fearful to post after observing unprofessional behaviour on Twitter from peers, a finding which echoes those by Choo *et al.* (2015), Little and Romee, (2020) and Pershad *et al.* (2018), who all described the threat to professionalism faced by HCPs on Twitter. Witnessing peers argue and post sensationalised comments on Twitter left FCPs feeling embarrassed and concerned, believing that younger and more inexperienced colleagues may be negatively affected by this online behaviour. Furthermore, FCPs felt unease regarding issues of uninvited patient contact, data protection, personal privacy, making mistakes and the permanence of posts online, which could result in real life professional repercussion. These attitudes are also consistent with findings from Grajales *et al.* (2014), Choo *et al*. (2015), Chan and Leung, (2018), Pershad *et al*. (2018) and Markham, Gentile and Graham (2020), who, although not directly referring to the physiotherapy profession, highlighted that these risks must be mitigated by HCPs by following guidance and taking precautions. Interestingly, in contrast to the work of Pershad *et al*. (2018), FCPs in this study described concerns around personal privacy on Twitter but did not discuss the risk of patient privacy being breeched through the sharing of x-rays and case notes for example. Additionally, although experienced clinicians, FCPs in this study doubted their own credibility and subsequently did not share knowledge publicly on Twitter. This finding builds on those from Choo et al. (2015), who stated that more experienced medics are less likely to use Twitter, resulting in a lack of knowledge and experience on the platform which could in fact be needed to help to fact check and maintain levels of professionalism.

Commonly held beliefs relating to the risk of experiencing unprofessional behaviour and privacy meant that the preferred behaviour of FCPs in this study was to refrain from sharing their own knowledge or opinion on Twitter. Despite this, Twitter was used to mobilise knowledge to inform their clinical practice and the mindlines model (Gabbay and le May, 2004) provides a useful theoretical lens for better understanding this. The mindlines model describes how in group settings, individual knowledge, judgement and clinical appraisal skills can be discussed and respectfully challenged by trusted colleagues, amending and developing both individual and collective mindlines through informal group sense making. This study has demonstrated the influence that Twitter can have on the formation of individual and collective mindlines amongst FCPs, as they use information and knowledge from the platform both for their own learning and to spark discussion offline with their trusted clinical colleagues in team meetings and CPD sessions. This reflects observations by Kimmerle *et al.* (2015), who showed that communication in an online social system forms what might be considered as collective mindlines - when social media communities develop new knowledge collectively, individual knowledge is simultaneously constructed independently. Even if they did not actively share knowledge themselves on Twitter, or did not even use the platform at all, this offline discussion allowed FCPs the opportunity to collectively process a blend of many different types of new explicit and tacit knowledge from Twitter in a way that they wouldn't have been able to do alone, thus enhancing individual and collective mindlines. This uptake of knowledge into mindlines demonstrates how knowledge acquisition is not a linear process; instead information and knowledge found on Twitter is moulded through individual reflection and group discussion, where it is adapted collectively before it fits the context in which it will be used, becoming Knowledge-in-Practice-in-Context (Gabbay *et al.,* 2020). However, a hostile environment on Twitter therefore adds further insight into FCP's preference to discuss knowledge found on Twitter face-to-face with colleagues, as mindlines need 'safe spaces' to develop (Gabbay and le May, 2011).

5.3.2 The functionality of Twitter gives rapid access to diverse sources of knowledge

Rapid access to succinct, up to date knowledge

A key finding from this study was that the functionality of Twitter enables FCPs to have rapid access to succinct, up-to-date knowledge to inform MSK clinical practice. FCPs believed this was a positive feature of the platform, reflecting observations by Rolls *et al.* (2016), who found that HCPs view virtual communities as valuable knowledge platforms for quality information to inform clinical decisions, and from Choo *et al*. (2015) who discussed Twitter as a valid way of quickly keeping up to date with academic literature when often primary research sources are inaccessible behind paywalls. Moreover, participants in this study believed it was easier to access empirical knowledge through links to articles in tweets than via traditional journal databases, which may also increase the breadth of information they have access to without having to formally search the literature, a finding also noted by Hebron (2018). FCPs in this study reported not having time to read through academic papers, which supports evidence from previous observations from Little and Romee, (2020), who illustrated how Twitter offers on the go learning for HCPs operating in fast paced environment. Findings were in contrast however, to Clode *et al.* (2021), who determined that electronic journals and webinars were seen as the most useful electronic learning resources by physiotherapists in New Zealand, in contrast to Twitter, which was used less frequently. Yet the same study found that information which is easier to access drives CPD amongst physiotherapists, a factor which could explain the use of Twitter, albeit as a complementary knowledge source to traditional methods of searching. FCPs in this study did not actively search for knowledge on Twitter, instead they scrolled through news feeds with an open mind as to what they will find, a behaviour consistent with social media use and referenced by O'Day and Heimberg, (2021), and supported by Choo *et al.* (2015), Pershad *et al.* (2018), and Little and Romee (2022), who all clearly described Twitter being a threat to HCP productivity and a tool that "facilitates procrastination" (Choo *et al.*, 2015, p. 414). This suggests a new type of knowledge perhaps specific to social media, in the form of a lucky dip of information obtained through passive appraisal of broad sources on a knowledge intermediary such as Twitter. Although studies have been undertaken looking at how other professional groups keep up to date with non-MSK knowledge on Twitter, for example infectious diseases such as Ebola (Goff, Kullar and Newland, 2015), examples in the literature of the use of Twitter particularly in the field of physiotherapy are sparse (Clode *et al.*, 2021) and the impact of physiotherapy-related tweets beyond immediate 'friends and family' online have been found to be minimal (Sabus *et al.*, 2019).

The breadth and depth of diverse knowledge on Twitter

This study found that FCPs believed the breadth and depth of diverse knowledge types found on Twitter was useful for clinical practice. This is consistent with work by Choo *et al*. (2015), who described Twitter as a complementary knowledge platform which acts as a 'curator' of different information. FCPs in this study reported accessing guidelines, policy reports, research evidence, debates and discussions on Twitter through scrolling and clicking on tweets from peers, reflecting the interconnectedness of knowledge use and the different types of explicit and tacit knowledge which can be mobilised and used by HCPs (Ward, 2017).

The importance FCPs place on having a breadth and depth of diverse knowledge for clinical practice can be further explained through the lens of mindlines. This study has shown that online sources of knowledge can be one of many sources which are blended together to influence and adjust clinical mindlines and inform clinical practice (Gabbay and le May, 2011; Wieringa *et al*., 2018) and that despite its superficiality and uncertainty, the functionality of Twitter resembles the insertion of knowledge into mindlines observed by Gabbay and le May (2011) in face-to-face contexts. This finding reflects examples seen in ethnographic mindlines studies of advanced nurse practitioners using smartphones for guidance when discharging patients from emergency departments (King, Sanders and Tod, 2021) and junior doctors in two teaching hospitals who used websites through smartphones for decision making (Lander and Balka, 2019). Both studies demonstrated that multiple online forms of evidence can be mixed together into mindlines with other types of knowledge, including research evidence and discussions with colleagues, to make decisions. As well as access to explicit knowledge and opinion sharing, Twitter provides FCPs with a platform on which curtailed discussion with others can take place. The informal sharing of anecdotes, story swapping, and debate was frequently observed on Twitter by FCPs in this study, who believed it to be useful for clinical practice as it supported both their explicit clinical knowledge and more nuanced and tacit contextual understanding of FCP policy, norms and expectations of the role. This blend of explicit and tacit knowledge is important for mindline development (Gabbay and le May, 2011) and is consistent with findings from Panahi, Watson and Partridge (2012), who showed that social media can facilitate the visibility and sharing of tacit knowledge to understand differing contexts through informal expert discussions. Additionally, Kind, Sanders and Tod (2021) and Lander and Balker (2019) showed that like the FCPs in this study, the more advanced the HCP, the more they built tacit knowledge gained through experience and discussion into their mindlines.

A key finding from this study showed that even though FCPs believe that Twitter is useful as a knowledge source within their busy, highly pressurised contexts, the volume of information on Twitter and the fear of missing something within the melee of misinformation leaves them feeling anxious. These findings are supported by Choo *et al.* (2015), who describe the volume of information as “drinking from the firehose” (Choo *et al.*, 2015, p413), acknowledging that this makes it difficult for professionals to filter information and absorb what is relevant and valuable to them and that valid knowledge could be lost. This challenge has been recognised as a pitfall in the literature regarding Twitter in healthcare (Pershad *et al.*, 2018) and more generally in the social media literature, which has shown that Fear of Missing Out (FOMO) is a negative recognised result of social media use (O’Day and Heimberg, 2021). Although not in the published literature, findings from this study may suggest the anxiety of ‘missing something’ echoes a deeper concern for FCPs around the novelty of their role, its rapid implementation and the resultant hurdles in its establishment and development, as participants tended to worry about missing important updates regarding the FCP roadmap and current trends in practice and policy on Twitter.

Engagement with visual tweets

This study determined that FCPs are most likely to engage with tweets containing images or infographics (See Figure 8: Key tweet ingredients). This behaviour can be compared to findings within the field of marketing and communications, which confirms the power of visuals to drive consumer engagement (Ordenes *et al.*, 2019), with tweets containing images, gifs or videos much more likely to generate engagement than basic text (Hutchinson, 2016). In an academic and healthcare context, tweets with the title of a research article, plus links and a visual abstract, receive more site visits than those without a visual (Ibrahim *et al.*, 2017). FCPs may prefer to engage with visuals because of the 'picture superiority effect'; information conveyed via pictures is better remembered than information studied as words (Defeyter, Russo and McPartlin, 2009). Findings in this thesis demonstrated that FCPs believed infographics on Twitter benefitted personal CPD, and were useful for onward knowledge sharing with both colleagues and patients. These results are in agreement with those published by Zadro *et al.* (2022), whose survey of HCPs, researchers and some patients determined that in terms of accessing health evidence, 92% thought detailed infographics were useful tools to communicate research as a substitute for reading a full text journal article and that 67% of respondents used Twitter to access and view these infographics. Furthermore, 64% believed that infographics reduce the time burden of reading the full text, aligning with reported behaviour from FCPs in this thesis that the bite-sized information in the form of infographics widely circulated on Twitter are of the most useful when faced with competing time demands.

Misinformation and credibility

FCPs in this study felt concerned about the amount of misinformation on Twitter and being able to find credible information and sources. These results reflect those of Choo *et al.* (2015), Little and Romee (2020) and Pershad *et al*. (2018), who all stated that navigating misinformation is a significant challenge for HCPs using Twitter, describing the difficulty in verifying credibility of sources (Pershad *et al.*, 2018). The attitudes and behaviours of FCPs towards misinformation and its associated risks can be further understood through the theoretical lens of mindlines. There is a risk of inaccurate information from an open forum such as Twitter becoming internalised into individual FCP mindlines and subsequently moving into collective mindlines, where large groups of people and professions may also share inaccurate knowledge - i.e., “mindlines can spread collective folly” (Gabbay and le May, 2011, p. 203). It is for this reason that Gabbay and le May explain that mindlines should be based on robust research wherever possible, stories and advice should always be respectfully challenged and questioned, and subjectivity and bias should be taken into account. Accurate mindlines therefore rely on knowing who to trust and who to sense check knowledge with, so as not to reinforce misinformation as discussions take place that could shape collective and individual mindlines (Gabbay and le May, 2011, 2016). FCPs reported needing to make individual judgements as to whether to trust people on Twitter, reflecting the fact that familiarity with someone makes a difference as to how individuals process the knowledge they may acquire from them. However, on Twitter, people often tweet sensationalised information or present the best version of themselves and their knowledge that they think others want to see, which may not always be accurate (Baccarella *et al.*, 2018; Pershad *et al.*, 2018). Therefore, knowledge from Twitter may inform individual and collective FCP mindlines, but this may in fact be knowledge acquired through a ‘rose tinted lens’ which further explains why FCPs want to then explore this knowledge with trusted colleagues face-to-face.

This study showed how FCPs filter knowledge and sources on Twitter for credibility. Interestingly, FCPs in this study believed that individuals who were outspoken or who had high numbers of followers on Twitter were not automatically credible, but liked and automatically trusted what they believed to be pre-appraised information tweeted by authoritative national bodies and academia. This is in contrast to findings from Gabby and le May (2004), who found that GPs tended to trust knowledge from colleagues in similar frontline positions to themselves rather than organisations or institutions. Commonly, participants in this thesis described knowledge needing to be edited, pre-packaged and easily digestible, demonstrating similarities with Actionable Nuggets (Mccoll *et al.*, 2015) and Clinical Knowledge Summaries (National Institute for Health and Care Excellence, 2022). Additionally, they liked reading the opinions of others within comments on Twitter posts in regards to clinical scenarios and reported that it was like having pre-packaged and pre-appraised evidence for use in their clinical practice. This belief supports those outlined by Little and Romee (2020), Choo *et al.* (2015) Panahi, Watson and Partridge (2016), Thoma *et al*. (2018), and Hebron (2018), who described Twitter comments as a way of crowdsourcing for peer review, critical commentary and feedback on ideas as well as inspiring people to read articles in greater depth. On an individual level, FCPs believed that appraising tweet sources and information themselves would be time consuming and therefore they did not do this routinely or systematically. This finding supports research by Clode *et al.* (2021) who found that physiotherapists did not frequently appraise the quality of electronic information, raising questions as to whether or not clinical practice decision making is consistently based on robust information in the context of Twitter. This belief can be explained in the literature regarding the phenomena of safety in numbers and the conversational norms of taking people at their word, which show us that people are less likely to fact check statements when they feel they are in the presence of others (as on social media), compared with when they are evaluating them alone (Jun, Meng and Johar, 2017). Furthermore, although conceptualised before the arrival of social media, the term ‘social loafing’ - when individual effort decreases in larger group sizes than when performing tasks individually (Latane, Williams and Harkins, 1979) - may offer further explanation for both the lurking behaviour of FCPs in this thesis and their appreciation of pre-appraised and pre-collated knowledge on Twitter.

Bias and echo chambers

Findings from this study showed that whilst FCPs are often content to follow the crowd on Twitter, they are also aware of the effect that biases on the platform could have on their clinical practice. These findings support those of Little and Romee (2020) who describe Twitter as a place where biases are amplified and align to the psychological and sociological concepts of conformity bias (when people agree with the views of the majority in order to be accepted by a social group (Padalia, 2014)) and confirmation bias (when users look for, or give greater weight to, information that reinforces their pre-existing beliefs, experiences and attitudes (Modgil *et al.*, 2021)).

This study found that FCPs are also aware of missing information due to echo chambers on Twitter, (where the same beliefs are reinforced without competing alternatives, reinforcing the same opinions and encouraging bias), reflecting extensive literature published in this area (Choo *et al.*, 2015; Brugnoli *et al.*, 2019; Little and Romee, 2020; Cinelli *et al.*, 2021; Modgil *et al.*, 2021). Although they described actively following people with diverse opinions on Twitter, the shared physiotherapy narrative online may in fact promote Selective Exposure (when users favour information close to their beliefs and therefore engage with similar networks often ignoring contradictory information), a major psychological contributor towards the development of echo chambers (Brugnoli *et al*., 2019; Cinelli *et al*., 2021).

5.3.3 Connection is important on Twitter

Using Twitter to overcome professional isolation

This study found that FCPs use Twitter to connect with peers, researchers and opinion leaders to feel more supported and less professionally isolated. FCPs in this study reported experiencing significant professional changes; from working in busy physiotherapy departments with peers, to more uncertain and solitary roles in primary care, a finding echoed by Greenhalgh, Selfe and Yeowell, (2020) and Ingram, Stenner and May, (2023). FCPs using Twitter to overcome isolation was a finding consistent with those of Chan and Leung (2018) and Rolls *et al.* (2016), whose literature reviews found that addressing professional isolation was one of the top reasons for HCPs to use social media. This was further echoed by Choo *et al*. (2015) and McLoughlin *et al*. (2018), who described a decrease in social and professional isolation due to online communities. This may be because Twitter offers opportunity for broader geographical connection, reducing professional barriers by encouraging real time, ongoing communication between peers and disciplines, benefits also attributed to virtual CoPs (McLoughlin *et al*., 2018; Thoma *et al*., 2018; Shaw *et al*., 2021). FCPs in this study also recognise that social media platforms such as Twitter provide environments in which collective knowledge can be co-constructed and relationships can be built (Phipps, Jensen and Myers, 2012). However, FCPs in this study were not actively part of a strong FCP Twitter community, a finding which contrasts to those from Little and Romee (2020), who discussed HCPs taking proactive and pragmatic opportunities to expand professional networks on Twitter, build professional relationships and develop communities for future collaborations. Instead, FCPs in this study were connected to a wider physiotherapy and MSK community by following others with similar clinical, policy and academic interests across the UK and in the NHS.

FCPs felt happy to learn from their clinical and research peers on Twitter, in part due to their lack of frequent interaction with colleagues. This is consistent with previous research findings that state communities on Twitter have been used to; advance learning by sharing links to resources (Choo et al 2015) and research evidence (Tunnecliffe et al., 2015); provide efficient learning opportunities; support career development, and; research advancement for healthcare professionals (Little and Romee 2020). Furthermore, this study found that FCPs connected with others through following, retweeting and liking posts which they could learn from. This echoes findings from Whiting and Williams (2013), who looked at how people are goal driven and actively use social media that satisfy their needs for key reasons including social interaction, information seeking and self-education, leading to eventual gratification and reoccurring use. Additionally, these findings correspond with how Twitter can be used to create environments supportive of information sharing, and learning (Frisch *et al.*, 2014). This has implications for how Twitter informs FCP clinical practice, as: “Online communities allow for tremendous diversity of experience and opinion and for disparate groups to come together over common interests, raising the potential to improve care on a number of levels” (Choo *et al.*, 2015, p143).

Using Twitter for reassurance

FCPs found value in using Twitter to read advice posted by peers and to feel reassured regarding their clinical practice. Fragmented working patterns and split roles may not easily facilitate interactions offline, therefore FCPs used Twitter to read about personal and professional challenges and difficulties, for example around clinical questions, the constantly changing guidance for the FCP role and the FCP roadmap. This finding builds on research by Ingram, Stenner and May, (2023), who aimed to explore MSK FCPs’ experiences of uncertainty in primary care. The authors determined that building and maintaining support networks, including use of informal online messaging applications, were considered a key way of mitigating the uncertainty that FCPs felt about a lack of role clarity and the nature of First Contact in primary care. This reassurance seeking behaviour is also reflected in findings from Choo *et al.* (2015), who determined that Twitter fulfils a professional need to receive ‘validation and encouragement’ by finding likeminded colleagues online: “Twitter can serve an important psychological role for healthcare providers, allowing them to share discouraging experiences or personal and professional challenges and receive validation and encouragement” (Choo *et al.*, 2015, p. 413). Again, although most FCPs in this study did not describe actively taking part in Twitter discussions, having access to read these was particularly valuable for them. Interestingly, FCPs in this study did not want to engage with patients online, contradicting literature by Berkovic *et al.* (2020) and Markham, Gentile and Graham, (2020), who argue that this is a beneficial use of the platform for HCPs.

Twitter expands the traditional coffee room

Reassurance seeking behaviour and a desire to feel less professionally isolated in the changing context of FCP practice can be further illustrated by looking at how the interactions influencing mindlines are moving beyond in person conversations and into the online space. Whilst initially described as informal primary care ‘coffee room chats,’ (Gabbay and le May, 2004), two decades later this study has shown how knowledge sources informing mindlines are changing, offering new ways of co-creating knowledge away from EBM (Wieringa *et al*., 2018). Twitter makes the ‘coffee room’ bigger for FCPs; offering them a context in which a vast amount of tacit knowledge, opinions and curtailed discussions can be accessed and taken offline for further considerations to eventually (or not) inform individual and collective mindlines. This finding is reflected in those by Wieringa *et al*. (2018), whose digital ethnographic study looked at three online clinical communities of doctors in the United Kingdom, the Netherlands, and Norway and found that story sharing, case narratives and medical news debates were shared more commonly than explicit guidelines or recommendations. There is however a contrast here, as Wieringa *et al*. studied a closed, moderated group of doctors on Facebook, differing to this study of FCPs on Twitter, which is an unregulated, open public forum. Furthermore, FCPs have had to demonstrate what Gabbay and le May call ‘contextual adroitness’ (Gabbay and le May, 2011); adapting to the culture, norms and expectations of different working environments, and adapting from the offline space into the Twitter world. Different mindlines form in different contexts, therefore many FCPs will have been thrust into a new and unfamiliar learning environment and will need to adapt, build upon or even disregard their existing physiotherapy mindlines in their new FCP context.

Using Twitter to access knowledge through networks

FCPs in this study believe it is useful for their clinical practice to connect directly with opinion leaders and researchers on Twitter. FCPs felt that accessing wider perspectives and opinions helped to inform their own clinical decisions. This finding is supported by Choo *et al.* (2015), who found the broad range of people on the open platform Twitter can give more varied perspectives than other social media platforms and traditional face-to-face networks. This also corresponds with previous findings from the 2018 systematic review by Chan and Leung which found that the variation on social networks enhanced communication and information sharing. Tweets from academics that signposted to evidence-based information were valued highly by FCPs, reflecting the significant role that Twitter plays in cross disciplinary knowledge sharing (Mohammadi *et al.*, 2017) and that 95.9% of HCPs surveyed by Tunnecliff *et al.,* (2015) believe there is a role for social media for accessing and sharing research evidence. FCP use of networks both online and offline to access knowledge for mindline development in this study reflects discussion by Cunningham and Shirley (2015), who reviewed the potential of Twitter and other social media platforms to co-construct collective mindlines across various virtual communities. They demonstrated that although face-to-face interaction with colleagues is important, there is also a wider network of peers available on social media with whom to collaborate, socialise and share knowledge.

5.4 Strengths and limitations of the study

5.4.1 Strengths of the study

This study explored a research question which has relevance to a new group of HCPs; FCPs. This study provides new insight and understanding of how FCPs use Twitter as a source of knowledge to inform their clinical practice, which provides a foundation for future research.

This study used a robust and established qualitative data collection method, semi-structured interviews, because they have been consistently shown to be effective in qualitative healthcare research to explore in-depth the experiences or views of individuals (Petty, Thomson and Stew, 2012; Dejonckheere and Vaughn, 2019). Semi-structured interviews allowed for opportunity to establish rapport; an important part of qualitative health research to establish empathy and build trust in order to elicit depth in the interview conversation for richer data and to answer the research question (Brinkman and Kvale, 2015). Recruitment methods worked well, for example concerns around repeated nomination of key people via snowball sampling did not arise and a diverse range of participants were recruited, representing a broad geographical and FCP career level demographic. This resulted in broad representation from the sample and provided various opinions from a range of individuals to be included in the data. Interviewing 19 FCPs was a strength of this study as it allowed for purposive sampling to gather the opinion of experts in a particular field (Martinez-Mesa *et al.*, 2016), enabling an in-depth exploration of one professional group and illuminating insights into a novel and important area. RTA is an established and rigorous method of analysing data in qualitative research and is often used in applied research (Braun and Clarke, 2014), facilitating final themes which should point to actionable items (Campbell *et al.*, 2021). Using RTA in this study therefore facilitated the development of recommendations for KM and FCPs which are explored in more depth in Section: 5.5 Thesis recommendations for First Contact Physiotherapists, knowledge mobilisation practice and research.

In order to maintain consistency and trustworthiness throughout the study, the decisions taken in the research process were consistently documented (Flick, 2020). This was done through an audit trail made up of memos and decision logs kept by the candidate, in order for the findings to reflect the research question, aims and objectives and not the bias of the researcher. Transcripts were checked and data, codes and themes were constantly compared (Cresswell, 2009). Deviant cases and the views of non-Twitter users were explored, ensuring a range of perspectives were presented to enhance trustworthiness of findings (Flick, 2020). Conducting data collection and analysis simultaneously meant that important or unanticipated insights could be explored further, for example, when the candidate noted that participants were also describing their use of other social media platforms such as Facebook and LinkedIn, additional questions to identify why Twitter was used over other platforms were added to the Twitter user topic guide. The project-based nature of the candidate's Knowledge Broker role within the IAU enabled opportunities for reflection with FCP, qualitative and KM experts in the unit's external networks. For example, findings were discussed with mindlines experts John Gabbay and Andrée le May, and NIHR Knowledge Mobilisation Research Fellows Fiona Cowdell and Kate Beckett. Ongoing discussions with these experts in the field of mindlines ensured that the candidate was simultaneously immersed in data and theory, so that appropriate approaches were selected and findings were trustworthy. Additionally, qualitative and KM researchers within the IAU were consulted. These meetings were more opportunistic and grew from the original analysis plan, which allowed for significant reflection and helped to focus the candidate's thinking for the discussion chapter. The use of de-briefing was conducted on a regular basis which further facilitated the trustworthiness of findings (Rolfe, 2006; Cresswell, 2009; Flick, 2020). A positionality statement was written and reflexive diary was kept to note researcher bias and context.

Reflexivity was maintained by the candidate throughout the study by writing a reflexive diary, further contributing to the reliability of findings. This reflexive thinking helped the candidate to acknowledge any impact that professional and personal roles, values and biases may have had on study findings and addressed any changes in the researchers perspective (Rolfe, 2006; Petty, Thomson and Stew, 2012). The candidate is not from a clinical or academic background, which helped to reduce pre-conceived opinion or knowledge of the physiotherapy profession in regards to data collection and analysis, however complete objectivity was not sought in this study, in fact the subjectivity and reflexivity of the researcher was a part of data collection and analysis.

The SAG and PPIE added value to the study by keeping the research relevant, providing additional contextual insights not previously considered, and providing feedback and insight into study findings. An in-depth discussion during the first SAG regarding patients following and engaging with their FCP on Twitter, resulted in the inclusion of a specific question in the Twitter user topic guide: “I have spoken to patients as part of this project, one point that came up was the opportunity for them to follow clinicians on Twitter. How would you feel about this?” In the interviews this question also allowed meaning and knowledge to be co-constructed between the candidate and the participant, as all participants who answered this question stated that they had not previously considered the subject. New attitudes, beliefs and behaviours were therefore captured in the replies to this question by being socially co-constructed between the candidate and the participant rather than being objectively determined, reflecting the underpinning constructionist epistemological philosophical assumption that there are multiple beliefs, realities and viewpoints to be co-created through the interview method. The rich data co-created from this question was a further strength to the study. Additionally, SAG members informed the interpretation of data, for example, they suggested combining all initial themes relating to knowledge and highlighted the importance of addressing the negative side of Twitter use, so as to maintain a balanced portrayal of the data which would then support the final recommendations.

Another strength of the study was the use of the mindlines model as an additional lens in which to interpret the data and which supplemented the inductive RTA, resulting in a novel contribution to the mindlines and KM literature. Mindlines provided deeper and richer insights within a KM context, which helped to provide insight for Knowledge Mobilisers to understand and potentially influence FCP mindlines via Twitter.

5.4.2 Limitations of the study

Although acknowledged as a further robust method for accuracy (Cresswell, 2009; Flick, 2020), within the limitations of this MPhil the triangulation of data by collecting a variety of data from different methods to cross check interpretations was not feasible, nor was it the intention of this work to collect multiple sources of data. Semi-structured interviews reduce the comparability of the data across participants, although for this study, their flexibility gave opportunity to be sensitive and responsive to the interviewee (Flick, 2020). There was also the potential for interviewer bias, when an interviewer can subconsciously influence participants to answer in a certain way (Bowling, 2009) and response bias, when participants may give the answers they think the researcher is looking for (Löhr, Weinhardt and Sieber, 2020). As interviews provide access to reports about a phenomenon yet do not give direct access to it (Flick, 2020), findings are understood at face value of participants' experiences and direct access is not achieved, further adding to the potential for response bias. However, there is evidence to suggest this wasn't the case as participants spoke openly about positive and negative elements of using Twitter, suggesting that they gave an honest account of their experiences. Additionally, the candidate used reflexivity throughout. Furthermore, the advert to recruit participants to the study was posted on Twitter and may have therefore also promoted a response bias, as these posts were shared within physiotherapy networks on the platform, therefore potentially limiting diversity as participants were already using and agreeable to the platform. However, this was mitigated by the concurrent use of email invitations to established networks to capture those not on Twitter, and the use of both purposive and snowball sampling allowed the candidate to include a broad range of perspectives from participants outside of existing and familiar networks.

A further limitation of this study was that it under-represented diverse characteristics, such as people of Black, African, Asian and Caribbean heritage, who were not purposefully sought for participation both in the SAG and FCP participants. In regards to the participant sample, whilst the candidate observed anecdotally that there was a range of nationalities, the majority of participants were not from diverse heritage, which may have limited the range of participant perspectives. However, for the SAG, by using a range of representation of professional and patient groups within the research process, who have a diverse range of external pressures, experience and understanding, diverse forms of knowledge would therefore inform the interview topic guides and research process. A further limitation relating to the participant sample was that it did not include FCPs who were prolific posters on Twitter. Purposefully sampling active users and influencers may have offered further insight into what makes someone more confident to share knowledge on Twitter and the reasons why they actively post and comment, providing contrast to those who use it more passively. Additionally, purposefully sampling FCPs from different models and experiences of FCP practice could have provided insight into whether certain FCP contexts influence behaviours on Twitter. These could include for example FCPs who work in hub models, FCPs who work across multiple practices or who are based in single practices, or FCPs who offer remote as well as face to face consultations. The focus on one particular professional group may impede transferability of results to other HCPs accessing knowledge via Twitter. However, findings illustrate several key issues which may not be unique to FCPs and are likely to be comparable to other HCPs working in isolation such as GPNs or GPs.

Finally, a further limitation for this study was that it was limited to just one snapshot in time. However, the online environment of Twitter moves rapidly, as demonstrated by the sale of Twitter in October 2022 to Elon Musk, which quickly created a fall in moderation standards (Tidy, 2022), the option to purchase authentication, the reinstatement of controversial and untrustworthy accounts, and many users leaving the platform (Kleinman, 2022). These factors may have resulted in an altered context from the one which was discussed with participants in their interviews for this study and highlights the challenge of research in fast paced, changing contexts (Pope, le May and Gabbay, 2008). The findings should therefore offer a potential starting point for more longitudinal work, which is discussed in more detail in Section 5.5: Thesis recommendations for First Contact Physiotherapists, knowledge mobilisation practice and research.

5.5 Thesis recommendations for First Contact Physiotherapists, knowledge mobilisation practice and research

Results from this thesis have shown that FCP participants are largely using Twitter passively, preferring to log in and ‘lurk’ rather than actively share their own MSK experience and expertise online. Some participants are not using the platform at all. Consequently, the data shows a distinct lack of active knowledge sharing on Twitter amongst FCP participants and therefore the potential for valuable knowledge to remain offline and in silos. This thesis has thus identified the need for recommendations on ways in which to boost FCP confidence to share knowledge on Twitter, including addressing the negative aspects of Twitter reported by participants. These recommendations have implications for FCPs, KM practice, and healthcare and KM research. The following sections present the recommendations from the results followed by the thesis conclusion.

Table 3: Recommendations related to thematic findings

Themes	Subthemes	Recommendation	Rationale for recommendation
THEME 1: How Twitter meets the needs of FCPs			
1	*Overcoming isolation*	The development of an FCP Twitter network, Tweetups and Twitter chats	To promote FCP peer knowledge sharing and gain support from others
	Rapid access and sharing of knowledge	The development of an FCP Twitter network, Tweetups and Twitter chats	For FCPs to use Twitter to access succinct, credible, up to date knowledge rapidly
	Gaining reassurance from peers	Provision of Twitter training at undergraduate, postgraduate and CPD levels	To show FCPs how to access networks for support and reassurance
		The development of an FCP Twitter network, Tweetups and Twitter chats	To promote gain support from other FCPs and share stories. To include opinion leaders
THEME 2: Twitter and a journey of knowledge to support clinical practice			
2	*Discovering a 'lucky dip' of new knowledge*	Provision of Twitter training at undergraduate, postgraduate and CPD levels	To support FCPs to use hashtags to search for information, to recognise trusted sources and knowledge on Twitter
		Training for Knowledge Mobilisers and Knowledge Brokers	To use key ingredients for an engaging tweet to make knowledge more visible, engage with FCPs and convey knowledge on Twitter
	The need to filter new knowledge	Establishing and promoting trusted Twitter networks via the CSP	To encourage active sharing of trusted, credible sources of knowledge

		Provision of Twitter training at undergraduate, postgraduate and CPD levels	To help FCPs to recognise trusted sources and knowledge on Twitter and to consider their own responsibility for posting trusted clinical content
		Training for Knowledge Mobilisers and Knowledge Brokers	To critically appraise knowledge on Twitter and signpost FCPs to trusted sources
	Adapting and using knowledge	Provision of Twitter training at undergraduate, postgraduate and CPD levels	To help FCPs to consider how to successfully adapt and use Twitter knowledge in practice
		Team leaders and Knowledge Mobilisers can encourage dedicated offline discussion time which includes appreciation of Twitter as a source of knowledge	To take knowledge from Twitter offline and adapt to offline contexts, enhancing individual and collective FCP mindlines offline as well as online
THEME 3: Factors impeding knowledge sharing on Twitter			
3	*Maintaining professional standards on an unregulated online platform*	Increased support and guidance for FCPs to use social media for accessing and sharing knowledge	To help FCPS to confidently and actively use Twitter professionally
		Clear processes for FCPs / physiotherapists who do not adhere to professional standards on Twitter	Discouraging unprofessional behaviour on Twitter and improving the online environment for knowledge sharing
		Provision of Twitter training at undergraduate, postgraduate and CPD levels	To enable FCPs to learn how to maintain a professional FCP identity and persona on Twitter
	Not fully engaging with Twitter	Provision of Twitter training at undergraduate, postgraduate and CPD levels	To encourage FCPs to have confidence to use Twitter by learning how to navigate intimidation and hostility,

			maintain good practice in terms of time management and plan content
		Team leaders and Knowledge Mobilisers can encourage dedicated offline discussion time which includes appreciation of Twitter as a source of knowledge	To develop individual and collective FCP mindlines offline as well as online
		A culture shift for Twitter use in KM strategies	To develop relationships to share knowledge across boundaries and inform clinical practice
	Concerns regarding privacy and blurred clinical boundaries	Provision of Twitter training at undergraduate, postgraduate and CPD levels	To enable FCPs to learn how to use Twitter’s privacy settings, when to use personal opinion, professional identity online, maintain good practice in terms of online safety

5.5.1 Recommendations for First Contact Physiotherapy policy and practice

Although participants discussed the benefits of Twitter, the data clearly showed a negative side and highlighted caveats which come with its use. These caveats must be acknowledged to help the FCPs who want to use it, to use it confidently and safely. Recognising the busy, pressurised and often isolated context in which FCPs (and other HCPs) work, there is a need for them to access succinct, credible information rapidly. Twitter provides an opportunity to keep up to date with relevant knowledge and offers a diverse range of opinion and experiences as well as curtailed discussions with colleagues, to inform clinical mindlines and enhance clinical decision making. However, although this knowledge is being taken offline by FCPs to share with colleagues and use in clinical practice, knowledge from FCPs is not reciprocated or actively shared on Twitter. To increase FCP confidence to use the platform and enable them to share their expert opinions and knowledge to benefit others in the profession beyond their offline silos, several steps need to be taken.

Firstly, the findings demonstrated some concern regarding professionalism online, with participants reporting witnessing instances of hostility and inflammatory comments, on Twitter. This resulted in a lack of confidence for FCPs to actively engage on Twitter, potentially preventing knowledge sharing and network building. These findings therefore indicate a gap in support and guidance for FCPs (and potentially more broadly, physiotherapists) to confidently and actively use Twitter in a professional capacity.

Although CSP guidance for social media use does exist (Chartered Society of Physiotherapy, 2019), FCPs interviewed for this study were not aware of it. Increased signposting and better KM of this resource is therefore needed. This CSP guidance could be further enhanced with clear processes for those who do not adhere to professional standards on social media. FCPs in this study reported an awareness of the importance of maintaining professionalism online as well as offline, which could be emphasized across the broader physiotherapy community through channels such as the CSP social media guidance. This would then go some way towards discouraging the unprofessional behaviour observed by participants on Twitter and consequently improve the online environment to encourage FCP knowledge sharing. Furthermore, establishing and promoting trusted Twitter networks via the CSP is important to encourage active sharing of trusted, credible sources of knowledge to facilitate and guide FCP knowledge sharing on Twitter.

To further boost FCP confidence to use Twitter for knowledge sharing and networking and acknowledging the increased presence of social media in professional capacities, Twitter training for professionals could be offered within physiotherapy undergraduate and postgraduate education. As Twitter, and social media more broadly, changes rapidly, ongoing education could be included as part of FCP CPD and training offered by national bodies such as the CSP. Any educational provision regarding Twitter would need to cover the following concerns which were raised by participants; how to maintain a professional FCP identity and persona; practical information regarding Twitter's functionality, including privacy settings and hashtag searching; considerations and responsibility regarding posting trusted content and when to use personal opinion; content planning; how to access networks for support and reassurance; navigating hostility; maintaining good practice in terms of time management and online safety; how to successfully adapt and use Twitter knowledge in practice; and recognising trusted sources and knowledge on Twitter. CPD training should be offered in a flexible, easy to access format, for example online or through local CoPs to fit into FCP schedules.

Furthermore, as part of the development of a trusted FCP specific Twitter network, the visibility of FCP opinion leaders, FCP peers and MSK researchers on Twitter could promote positive knowledge sharing, influence clinical mindlines and inspire confidence to use the platform. A shift in culture is needed to understand the role of social media in clinical practice and implement support for this, including more time for social media incorporated into NHS practice.

Secondly, the findings showed that knowledge seen on Twitter can spark face-to-face conversations between FCPs and their teams and subsequent adaptation of information into the local context and amendment of individual and collective mindlines. Considering that information becomes knowledge when we interact with it, and that individual mindlines are developed collectively through social processes with trusted others, information gleaned from Twitter needs to be actively discussed with colleagues in order to be embedded into mindlines and inform clinical practice. For FCPs in this study, taking knowledge from Twitter and actively using and sharing it offline was more commonplace than actively engaging with it on Twitter. This was reported by participants to be because of Twitter’s potential to promote hostility, resulting in them feeling intimidated and anxious to share their own knowledge or engage in discussion online. Yet FCP participants were aware of the platform's knowledge promoting benefits and were positive about its potential for discovering important information. Team leaders and Knowledge Mobilisers therefore may find it useful to be aware that FCPs do use Twitter as a source of knowledge to inform their clinical practice, but only actively use and share that knowledge in the offline space. Allowing for and encouraging dedicated offline discussion time which includes appreciation of Twitter as a source of knowledge is therefore also important as this is where knowledge sharing between FCPs is occurring and individual and collective mindlines are developing. These offline discussions and social media prompts could be purposefully included in team meetings, local newsletters, dedicated CoPs or local training sessions.

5.5.2 Recommendations for knowledge mobilisation practice

Twitter offers a platform for conversation, which is key to effective KM as it relies on two-way relationship building to share knowledge. However, findings from this thesis indicate that active knowledge sharing on Twitter through FCP conversation is not routinely taking place and FCPs are not using the platform to build and nurture relationships to facilitate this. Furthermore, the ways that in which Twitter is used to mobilise knowledge appears to be a poorly understood area, despite participants reporting that it does in fact play a role offline as a knowledge source informing clinical practice. A culture shift acknowledging the role Twitter could play in developing relationships to share knowledge across boundaries and inform clinical practice may increase its potential as an important strategy for KM, and consequently more research needs to be carried out in this field.

Clinicians and Knowledge Mobilisers need to be mindful that although Twitter is an unregulated platform whereby power structures may break down and hostilities may be present, its potential to connect researchers and FCPs could enable onward knowledge sharing both online and offline to inform clinical decision making and practice. Knowledge Brokers, who play a role in connecting and translating knowledge, can potentially use Twitter to enhance and amend FCP mindlines through targeted signposting and discussion, as just one of many potential KM tools at their disposal. This can be done using the key ingredients for an engaging tweet shown to be effective in this thesis to convey knowledge on Twitter. Furthermore, hosting Tweetups and Twitter chats to bring together communities could be potential avenues through which to nurture more trusted relationships in the online space and may increase the notoriety and credibility of KM groups such as the IAU. Knowledge Brokers may find it useful to be aware of and mitigate for the factors that may impede knowledge sharing, reported by participants to include hostility, unprofessionalism, misinformation, bias and privacy concerns. In particular, to address these, Knowledge Brokers may have a role to play in critically appraising knowledge on Twitter, directing FCPs to known trusted sources, and facilitating safe spaces for networking and engagement with trusted sources. Knowledge Brokers should also target opinion leaders and support FCP leadership on Twitter because of the potential role they play in influencing practice.

Many participants in this study reported needing to actively take knowledge discovered on Twitter into the offline space for further discussion with physiotherapy colleagues, which reinforces collective mindlines. Knowledge Brokers would therefore also need to supplement the use of Twitter as a knowledge source by targeting this process of individual to collective mindline formation offline. This could be done by actively supporting face-to-face discussions or CoPs following Twitter knowledge discovery. As mindline development depends on interaction with trusted groups of colleagues, which participants reported was not common on Twitter, there is also a need for a specific FCP (rather than broadly physiotherapy) community, CoP, or virtual CoP, to be established. Knowledge Brokers could then eventually bring knowledge gleaned from these offline groups back onto the online Twitter space.

This study has highlighted the paucity of published strategies, tools and guidance in relation to targeted social media strategies in KM work and supports findings from Elliott *et al.* (2020), who recommend a social media strategy be embedded in KM activities from the beginning of research. This thesis supports this recommendation and has highlighted the gap that there are no current theories, models or frameworks in KM that offer advice for successful social media strategies in KM and no current social media theories that fit with the complexities and contexts of KM strategies. Findings from the interviews would suggest that there is demand amongst this cohort of FCPs, and potentially other clinical groups, for easily accessible, pre-packaged, bite-sized knowledge which could be delivered to them more effectively with the foresight of using social media and clinical opinion leaders within KM and implementation packages of work. Given that Twitter is free, rapid and easy to use, and available to difficult to access populations, the platform could be a valuable change agent tool for Knowledge Mobilisers to facilitate KM and relationship building, by bridging silos and helping to reduce the evidence-to-practice gap. However, given the negative aspects of Twitter reported by participants, preparatory work may need to be carried out first in order to encourage FCPs who do not use Twitter to join up, and those who do not post frequently to become more engaged.

Training for Knowledge Mobilisers and Knowledge Brokers is also important to facilitate knowledge sharing both on Twitter and offline. Training could include how to develop trusted FCP communities on Twitter as well as offline FCP CoPs to encourage the use of Twitter as a knowledge source for clinical practice and to promote debate, discussion and tacit knowledge development. As this study demonstrated FCP use of Twitter knowledge in offline contexts, increased awareness and understanding of this process of mindline development is important for Knowledge Mobilisers and Knowledge Brokers supporting active discussions around knowledge from Twitter. Training could also include how to encourage more FCPs to join the platform, and how to successfully engage with FCPs via Twitter, for example using images and short and snappy text, with pre-packaged and pre-appraised trusted knowledge, and how to encourage mindline development, for example through signposting and discussion.

These recommendations could ultimately speed up the time it takes for knowledge to cross the evidence-to-practice gap by boosting confidence on Twitter and increasing conversation and relationship building.

5.5.3 Recommendations for healthcare and knowledge mobilisation research

This study has provided a platform for future research to advance the field of KM in healthcare in two key areas. The first issue concerns developing a fuller picture of the role that Twitter plays in healthcare practice. The second issue relates to further theoretical exploration using mindlines.

The role of Twitter in healthcare practice

To get a more complete picture of the role Twitter plays in healthcare KM, similar research could be carried out with other professional groups and in other healthcare contexts. For example, questions still remain around what makes an FCP, or other HCPs, frequent tweeters and how less confident HCPs can be supported to use the platform effectively. Additionally, the SAG highlighted a question around how patients and HCPs interact and share MSK knowledge on Twitter. Further work would therefore be needed to explore this and to determine how to incorporate the public voice into tweets aimed at sharing health information with patients. Interviews and focus groups could answer these research questions by providing insight into the views and experiences of the different stakeholder groups.

The role of mindlines on Twitter

From a theoretical perspective, specifically exploring how FCP and lay mindlines are influenced by Twitter would be useful, as this study has only used mindlines as a theoretical lens for deeper interpretation. Furthermore, mindlines are shaped and developed over very long periods of time and Twitter works too quickly for mindlines to be significantly explored within a snapshot of time, providing a challenge for shorter studies such as this MPhil. Additionally, the FCP role is too new to really see mindline development in action. Therefore, an ethnographic study to observe mindline development longitudinally over time in these participant groups would be valuable. This could also provide tangible examples of practice change from interventions such as research findings publicised on Twitter.

Participants felt concern around patients moving from being solely in a professional clinic space into more personal interactions on Twitter. The negotiation space between lay and practitioner mindlines have started to be explored in the literature (Cowdell, Ahmed and Layfield, 2020; Beckett *et al.*, 2022). Future work to address the ways in which social media may be used to mobilise knowledge between HCPs and patients and the public is needed to develop thinking around the breakdown of traditional lay and practitioner boundaries online.

Finally, research looking at whether the SECI Spiral (also known as the knowledge spiral) can explain how HCPs learn from Twitter could provide interesting findings. Originally conceptualised by Nonaka and Takeuchi, (1995), the SECI spiral demonstrates the fluid, multidirectional and multifaceted process of tacit knowledge acquisition in mindlines and shows that social observation and informal interaction are the foundations on which knowledge is acquired and reinforced in groups. The SECI spiral consists of four stages of knowledge expansion; Socialisation; Externalisation; Combination; and Internalisation, which could all be explored in more depth using specific interview questions or focus group discussions.

5.6 Knowledge mobilisation of findings

Findings from this study should be disseminated via social media, the CSP communications team, MSK and KM conferences and academic publication. The use of RTA in this study has supported the generation of final themes and findings which point to actionable recommendations (Campbell *et al.*, 2021). These include FCP, physiotherapist and Knowledge Mobiliser training, establishment and development of FCP specific, supportive Twitter networks, co-creation of enhanced Twitter conduct and information credibility guidance with the CSP and support for Knowledge Brokers to use Twitter to network between silos and identify and signpost FCPs to credible, useful knowledge for practice. These recommendations should be co-produced with relevant clinical, academic and patient stakeholders. Knowledge should be mobilised via IAU clinical, KM and public networks, IAU hosted KM training, IAU CoPs and collaborative educational Tweetchats. A third SAG will be held to explore next steps for the project (including mobilising findings) with relevant stakeholders.

5.7 Conclusion

This thesis adopted a KM perspective and aimed to explore the attitudes, beliefs and behaviours of MSK FCPs about using Twitter as a source of knowledge to inform clinical practice. The findings have provided insights into how the functionality of Twitter both meets the needs of FCPs and presents challenges for them. Findings have also started to show how mindlines play a part in the way that FCPs find, adapt and use knowledge from Twitter. These findings could have significant impact on FCP policy and practice, KM practice and future research. Further work is needed to include social media in professional training at all levels, develop professional guidelines and governance procedures, create FCP specific Twitter networks, recognise Twitter as a strategy for KM and to research the role of Twitter in healthcare practice.

References

Ackoff, R. L. (1989) ‘From Data to Wisdom’, *Journal of Applied Systems Analysis*, 16, pp. 3–9. Available at: https://softwarezen.me/wp-content/uploads/2018/01/datawisdom.pdf (Accessed: 20 March 2021)

Allen, C.G., Andersen, B., Chambers, D. A., Groshek, J., Roberts, M.C. (2018) ‘Twitter use at the 2016 Conference on the Science of Dissemination and Implementation in Health: analyzing #DIScience16’ *Implementation Science,* 13(1). doi: 10.1186/s13012-018-0723-z

Altman, D. G. (1994) ‘The scandal of poor medical research’, *Bmj*, 308(6924), p. 283. doi: 10.1136/bmj.308.6924.283

Altmetric (2021) *Altmetric* Available at: https://www.altmetric.com/ (Accessed: 11 October 2021)

Appel, G., Grewal, L., Hadi, R., Stephen, A.T. (2020) ‘The future of social media in marketing’, *Journal of the Academy of Marketing Science*, 48(1), pp. 79–95. doi: 10.1007/s11747-019-00695-1

Aranda, K. and Jones, A. (2008) ‘Exploring new advanced practice roles in community nursing: A critique: Feature’, *Nursing Inquiry*, 15(1), pp. 3–10. doi: 10.1111/j.1440-1800.2008.00393.x

Archibald, M. M., Ambagtsheer, R.C., Casey, M.G., Lawless, M. (2019) ‘Using Zoom Videoconferencing for Qualitative Data Collection: Perceptions and Experiences of Researchers and Participants’, *International Journal of Qualitative Methods*, 18, pp. 1–8. doi: 10.1177/1609406919874596

Arigo, D., Pagoto, S., Carter-Harris, L., Lillie, S.E., Nebeker, C. (2018) ‘Using social media for health research: Methodological and ethical considerations for recruitment and intervention delivery’, *Digital Health*, 4, p. 205520761877175. doi: 10.1177/2055207618771757

Arthritis and Musculoskeletal Alliance (2021) *About Musculoskeletal Disorders (MSK)*

Available at: http://arma.uk.net/musculoskeletal-disorders-msk/?gclid=CISo97uQptICFYYcGwodeVwAhA (Accessed: 11 January 2021)

Baccarella, C. V., Wagner, T., Kietzmann, J., McCarthy, I.P. (2018) ‘Social media? It’s serious! Understanding the dark side of social media’, *European Management Journal*, 36(4), pp. 431–438. doi: 10.1016/j.emj.2018.07.002

Baird, B., Charles, A., Honeyman, M., Maguire, D. and Das, P. (2016) *Understanding pressures in general practice.* The Kings Fund Report. Available at: https://www.kingsfund.org.uk/publications/pressures-in-general-practice (Accessed: 20 November 2021)

Baird, B., Lamming, L., Bhatt, R., Beech, J., Dale, V. (2022) *Integrating additional roles into Primary Care networks.* The Kings Fund Report. Available at: https://www.kingsfund.org.uk/sites/default/files/2022-02/Integrating%20additional%20roles%20in%20general%20practice%20report%28web%29.pdf (Accessed: 30 January 2023)

Bassett, A. M. and Jackson, J. (2021) ‘The professional development and career journey into musculoskeletal first contact physiotherapy : a telephone interview study’, *Physiotherapy Theory and Practice*. 38(10), pp. 1453-1468. doi: 10.1080/09593985.2021.1872127

Baxter, S., Reed, H., Clarke, Z., Judge, S., Heron, N., McCarthy, … Mcdermott, C.J. (2016) ‘Evaluating a novel cervical orthosis, the Sheffield Support Snood, in patients with amyotrophic lateral sclerosis/motor neuron disease with neck weakness’, *Amyotrophic Lateral Sclerosis and Frontotemporal Degeneration*, 17(5–6), pp. 436–442. doi: 10.3109/21678421.2016.1148170

Bayley, J. E., Phipps, D., Batac, M., Stevens, E. (2018) ‘Development of a framework for knowledge mobilisation and impact competencies’, *Evidence and Policy*, 14(4), pp. 725–738. doi: 10.1332/174426417X14945838375124

Bearne, L. M., Gregory, W. J. and Hurley, M. V. (2021) ‘Remotely delivered physiotherapy: Can we capture the benefits beyond COVID-19?’, *Rheumatology (Oxford)*, 60(4), pp. 1582–1584. doi: 10.1093/rheumatology/keab104

Beckett, K., Deave, T., McBride, T., le May, A., Gabbay, J., Kapoulas, U., … Kendrick, D. (2022) ‘Using Forum Theatre to mobilise knowledge and improve NHS care: the Enhancing Post-injury Psychological Intervention and Care (EPPIC) study’, *Evidence and Policy*, 18(2), pp. 236–264. doi: 10.1332/174426421X16420902769508

Berkovic, D., Ackerman, I.N., Briggs, A.M. and Ayton, D. (2020) ‘Tweets by people with arthritis during the COVID-19 pandemic: Content and sentiment analysis’, *Journal of Medical Internet Research*, 22(12). Article e24550. doi: 10.2196/24550

Biddle, S. J. H., Mutrie, N., Gorely, T. and Faulkner, G. (2021) *Psychology of physical activity : determinants, well-being and interventions*. Fourth. Abingdon: Routledge

Boaz, A., Hanney, S., Borst, R., O’Shea, A. and Kok, M. (2018) ‘How to engage stakeholders in research: Design principles to support improvement’, *Health Research Policy and Systems*, 16(1). doi: 10.1186/s12961-018-0337-6

Bornbaum, C. C., Kornas, K., Peirson, L. and Rosella, L.C. (2015) ‘Exploring the function and effectiveness of knowledge brokers as facilitators of knowledge translation in health-related settings: A systematic review and thematic analysis’, *Implementation Science*, 10. doi: 10.1186/s13012-015-0351-9.

Bourke, B. (2014) ‘Positionality: Reflecting on the research process’, *The Qualitative Report*, 19(33), pp. 1–9. doi: 10.46743/2160-3715/2014.1026

Bowen, S. J. and Graham, I. D. (2013) ‘From knowledge translation to engaged scholarship: Promoting research relevance and utilization', *Archives of Physical Medicine and Rehabilitation*, 94(1). doi: 10.1016/j.apmr.2012.04.037

Bowling, A. (2009) *Research methods in health: Investigating health and health services*. Third. Open University Press

Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, 3(2), pp. 77–101. doi: 10.1191/1478088706qp063oa

Braun, V. and Clarke, V. (2014) 'What can "thematic analysis" offer health and wellbeing researchers?', *International Journal of Qualitative Studies on Health and Well-being*. 9. doi: 10.3402/qhw.v9.26152

Braun, V. and Clarke, V. (2019) 'Reflecting on reflexive thematic analysis', *Qualitative Research in Sport, Exercise and Health*, 11(4), pp. 589–597. doi: 10.1080/2159676X.2019.1628806

Braun, V. and Clarke, V. (2021a) 'One size fits all? What counts as quality practice in (reflexive) thematic analysis?', *Qualitative Research in Psychology*, 18(3), pp. 328–352. doi: 10.1080/14780887.2020.1769238

Braun, V. and Clarke, V. (2021b) *Thematic analysis: a practical guide to understanding and doing*. First. SAGE Publications Ltd

Braun, V. and Clarke, V. (2022) *Doing reflexive TA*. Available at: https://www.thematicanalysis.net/doing-reflexive-ta/ (Accessed: 30 November 2022)

Brett, J., Staniszewska, S., Mockford, C., Herron-Marx, S., Hughes, J., Tysall, C. and Suleman, R. (2014) 'Mapping the impact of patient and public involvement on health and social care research: A systematic review', *Health Expectations*, 17(5), pp. 637–650. doi: 10.1111/j.1369-7625.2012.00795.x

Briggs, A. M., Woold, D. A., Dreinhoefer, K., Homb, N., Hoy, D. G., Kopansky-Giles, D., Åkesson, K. and March, L. (2018) 'Reducing the global burden of musculoskeletal conditions', *The Bulletin of the World Health Organisation*, pp. 366–368. doi: 10.2471/BLT.17.204891

Brinkman, S. and Kvale, S. (2015) *Interviews: Learning the Craft of Qualitative Research Interviewing*. Third. SAGE Publications Ltd

Brugnoli, E., Cinelli, M., Quattrociocchi, W., Scala, A. (2019) 'Recursive patterns in online echo chambers', *Scientific Reports*, 9(1), Article 20118. doi: 10.1038/s41598-019-56191-7

Bruvold, W. H. (1972) 'Consistency among attitudes, beliefs, and behavior', *Journal of Social Psychology*, 86(1), pp. 127–134. doi: 10.1080/00224545.1972.9918603

Bryman, A. (2008) *Social Research Methods*. Third. Oxford University Press

Buchan, J., Charlesworth, A., Gershlick, B., Seccombe, I., (2019) *A critical moment : NHS staffing trends , retention and attrition.* Health Foundation Report. Available at: https://www.health.org.uk/publications/reports/a-critical-moment (Accessed: 30 November 2022)

Burton, C. R. and Rycroft-Malone, J. (2015) 'An untapped resource: Patient and Public Involvement in Implementation', *International Journal of Health Policy and Management*, 3(3), pp. 113–115. doi: 10.15171/ijhpm.2014.74

Campbell, K. A., Orr, E., Durepos, P., Nguyen, L., Li, L., Whitmore, C., … Jack, S.M. (2021) 'Reflexive thematic analysis for applied qualitative health research', *Qualitative Report*, 26(6), pp. 2011–2028. doi: 10.46743/2160-3715/2021.5010

Campbell, M. K., Meier, A., Carr, C., Enga, Z., James, A. S., Reedy, J. and Zheng, B. (2001) 'Health behavior changes after colon cancer: A comparison of findings from face-to-face and on-line focus groups', *Family and Community Health*, 24(3), pp. 88–103. doi: 10.1097/00003727-200110000-00010

Cassarino, M., Quinn, R., Boland, F., Ward, M. E., McNamara, R., O'Connor, M. …

Robinson, K. (2020) ‘Stakeholders’ perspectives on models of care in the emergency department and the introduction of health and social care professional teams: A qualitative analysis using World Cafés and interviews’, *Health Expectations*, 23(5), pp. 1065–1073. doi: 10.1111/hex.13033

Castle-Clarke, S., Edwards, N. and Buckingham, H. (2017) *Falling short: Why the NHS is still struggling to make the most of new innovations*, Nuffied Trust Report. Available at: https://www.nuffieldtrust.org.uk/research/falling-short-why-the-nhs-is-still-struggling-to-make-the-most-of-new-innovations (Accessed: 30 November 2022)

Chalmers, I. and Glasziou, P. (2009) ‘Avoidable waste in the production and reporting of research evidence’, *The Lancet*, 374(9683), pp. 86–89. doi: 10.1016/S0140-6736(09)60329-9

Chan, W. S. Y. and Leung, A. Y. M. (2018) ‘Use of social network sites for communication among health professionals: Systematic review’, *Journal of Medical Internet Research*, 20(3). doi: 10.2196/jmir.8382

Chang, Y., Li, Y., Yan, J. and Kumar, V. (2019) ‘Getting more likes: the impact of narrative person and brand image on customer–brand interactions’, *Journal of the Academy of Marketing Science*, 47(6), pp. 1027–1045. doi: 10.1007/s11747-019-00632-2

Chartered Society of Physiotherapy (2018) *First Contact Physiotherapy posts in General Practice, A Guide for Implementation in England*. Available at: https://www.csp.org.uk/system/files/001404_fcp_guidance_england_2018.pdf (Accessed: 20 November 2022)

Chartered Society of Physiotherapy (2019) *Social media guidance for CSP members*. Available at: https://www.csp.org.uk/publications/social-media-guidance-csp-members (Accessed: 30 November 2022)

Chartered Society of Physiotherapy (2022a) *Developing an FCP peer network*. Available at: https://www.csp.org.uk/professional-clinical/improvement-innovation/first-contact-physiotherapy/developing-fcp-peer (Accessed: 30 November 2022)

Chartered Society of Physiotherapy (2022b) *First Contact Physiotherapists - FAQs*. Available at: https://www.csp.org.uk/professional-clinical/improvement-innovation/first-contact-physiotherapy/first-contact (Accessed: 30 November 2022)

Choo, E. K., Ranney, M. L., Chan, T. M., Trueger, N. S., Walsh, A. E., Tegtmeyer, K., … Carroll, C. L. (2015) 'Twitter as a tool for communication and knowledge exchange in academic medicine: A guide for skeptics and novices', *Medical Teacher*, 37(5), pp. 411–416. doi: 10.3109/0142159X.2014.993371

Cinelli, M., Morales, G. D. F., Galeazzi, A., Quattrociocchi, W. and Starnini, M. (2021) 'The Echo Chamber Effect on social media', *Computer Science*, 118(9). Article e2023301118. doi: 10.1073/pnas.2023301118

Clode, N. J., Darlow, B., Rouse, J. and Perry, M. (2021) 'What electronic information resources do physiotherapists prefer to use to support their CPD?', *Physiotherapy Research International*, 26(1). Article e1881. doi: 10.1002/pri.1881

Concannon, T. W., Grant, S., Welch, V., Petkovic, J., Selby, J., Crowe, S., … Multi Stakeholder Engagement (MuSE) Consortium. (2019) 'Practical Guidance for Involving Stakeholders in Health Research', *Journal of General Internal Medicine*, 34(3), pp. 458–463. doi: 10.1007/s11606-018-4738-6

Concannon, T. W., Meissner, P., Grunbaum, J. A., McElwee, N., Guise, J.M., Santa, J., … Leslie, L. K. (2012) 'A new taxonomy for stakeholder engagement in patient-centered outcomes research', *Journal of General Internal Medicine*, 27(8), pp.

985–991. doi: 10.1007/s11606-012-2037-1

Contandriopoulos, D., Lemire, M., Denis, J.L, and Tremblay, E. (2010) ‘Knowledge exchange Processes in Organisations and Policy Arenas: A Narrative Systematic Review of the Literature’, *The Milbank Quarterly*, 88(4), pp. 444–483. doi: 10.1111/j.1468-0009.2010.00608.x

Cooksey, D. (2006) *A review of UK health research funding A review of UK health research funding*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228984/0118404881.pdf (Accessed: 30 November 2022)

Cottrell, E., Foster, N. E., Porcheret, M., Rathod, T, and Roddy, E. (2017) ‘GPs’ attitudes, beliefs and behaviours regarding exercise for chronic knee pain: A questionnaire survey’, *BMJ Open*, 7(6). Article e014999. doi: 10.1136/bmjopen-2016-014999

Cowdell, F. (2018) ‘Knowledge mobilisation: An ethnographic study of the influence of lay mindlines on eczema self-management in primary care in the UK’, *BMJ Open*, 8(8). Article e021498. doi: 10.1136/bmjopen-2018-021498

Cowdell, F. (2019) ‘Knowledge mobilisation: an ethnographic study of the influence of practitioner mindlines on atopic eczema self-management in primary care in the UK’, *BMJ Open*, 9(7). Article e025220. doi: 10.1136/bmjopen-2018-025220

Cowdell, F., Ahmed, T., and Layfield, C. (2020) ‘Knowledge Mobilisation: a UK co-creation study to devise strategies to amend lay and practitioner atopic eczema mindlines to improve consultation experiences and self-care management practices in primary care’, *BMJ Open*, 10(9). Article e036520. doi: 10.1136/bmjopen-2019-036520

Cranefield, J., Yoong, P. and Huff, S. L. (2015) ‘Rethinking Lurking : Invisible Leading and Following in a Knowledge Transfer Ecosystem', *Journal of the Association for Information Systems*, 16(4), pp. 213–247. doi: 10.17705/1jais.00394

Cranley, L. A., Keefe, J. M., Taylor, D., Thompson, G., Beacom, A. M., Squires, J. E., … Berta, W. B. (2019) 'Understanding professional advice networks in long-term care: An outside-inside view of best practice pathways for diffusion', *Implementation Science*, 14(1). Article number 10. doi: 10.1186/s13012-019-0858-6

Cresswell, J. W. (2009) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Third. Sage Publications, Inc

Cunningham, A. M. and Shirley, A. (2015) 'Mindlines in a digital age', *Education for Primary Care*, 26(5), pp. 293–296. doi: 10.1080/14739879.2015.1079010

Currie, G., Burgess, N., White, L., Lockett, A., Gladman, J. and Waring, J. (2014) 'A qualitative study of the knowledge-brokering role of middle-level managers in service innovation: managing the translation gap in patient safety for older persons' care', *Health Services and Delivery Research*, 2(32). doi: 10.3310/hsdr02320

Currie, G., Kiefer, T. and Spyridonidis, D. (2020) 'From what we know to what we do: Enhancing absorptive capacity in translational health research', *BMJ Leader*, 4(1), pp. 18–20. doi: 10.1136/leader-2019-000166

Davies, H. T., Powell, A. E. and Nutley, S. M. (2015) 'Mobilising knowledge to improve UK health care: learning from other countries and other sectors – a multimethod mapping study', *Health Services and Delivery Research*, 3(27), pp. 1–190. doi: 10.3310/hsdr03270

Deaves, A., Trainor, K., and Grant, E. (2017) 'Do final year undergraduate physiotherapy students value Twitter as an educational tool? A mixed methods study', *Physiotherapy*, 103, e72. doi:

https://doi.org/10.1016/j.physio.2017.11.033

De Leo, G., LeRouge, C., Ceriani, C. and Niederman, F. (2006) 'Websites most frequently used by physician for gathering medical information.', *AMIA Annual Symposium proceedings*, 2006(902). Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1839616/#__ffn_sectitle (Accessed: 30 November 2022)

Defeyter, M. A., Russo, R. and McPartlin, P. L. (2009) 'The picture superiority effect in recognition memory: A developmental study using the response signal procedure', *Cognitive Development*, 24(3), pp. 265–273. doi: 10.1016/j.cogdev.2009.05.002

Dejonckheere, M. and Vaughn, L. M. (2019) 'Semistructured interviewing in primary care research: a balance of relationship and rigour', *Family Medicine and Community Healthealth*, 7(2). Article e000057. doi: 10.1136/fmch-2018-000057

Depala, N and Greene, G. (2016) 'Social media in physiotherapy undergraduate education: who's tweeting?', *Physiotherapy*, 102s, eS104. doi: https://doi.org/10.1016/j.physio.2016.10.110

Department of Work and Pensions (2016) *Autumn Statement 2016*. Available at: https://www.gov.uk/government/publications/autumn-statement-2016-documents/autumn-statement-2016 (Accessed: 15 November 2021)

Deverka, P. A., Lavallee, D. C., Desai, P. J, Esmail, L. C., Ramsey, S. D., Veenstra, D. L, and Tunis, S. R. (2013) 'Stakeholder participation in comparative effectiveness research: Defining a Framework for Effective Engagement', *Journal of Comparative Effectiveness Research*, 1(2), pp. 181–194. doi: 10.2217/cer.12.7

Dodds, S. and Hess, A. C. (2021) 'Adapting research methodology during COVID-19: lessons for transformative service research', *Journal of Service Management*, 32(2), pp. 203–217. doi: 10.1108/JOSM-05-2020-0153

Dolovich, L., Pottie, K., Kaczorowski, J., Farrell, B., Auston, Z., Rodriguez, C., … Sellors, C. (2008) ‘Integrating family medicine and pharmacy to advance primary care therapeutics’, *Clinical Pharmacology and Therapeutics*, 83(6), pp. 913–917. doi: 10.1038/clpt.2008.29

Donetto, S., Pierri, P., Tsianakas, V, and Robert G. (2015) ‘Experience-based co-design and healthcare improvement: Realizing participatory design in the public sector’, *Design Journal*, 18(2), pp. 227–248. doi: 10.2752/175630615X14212498964312

Downie, F., McRitchie, C., Monteith, W., and Turner, H. (2019) ‘Physiotherapist as an alternative to a GP for musculoskeletal conditions: a 2-year service evaluation of UK primary care data’, *British Journal of General Practice*, 69(682), pp. e314–e320. doi: 10.3399/bjgp19X702245

Drabble, L., Trocki, K. F., Salcedo, B., Walker, P. C, and Korcha, R. A. (2016) ‘Conducting qualitative interviews by telephone: Lessons learned from a study of alcohol use among sexual minority and heterosexual women’, *Qualitative Social Work*, 15(1), pp. 118–133. doi: 10.1177/1473325015585613

Ducey, A., Donoso, C., Ross, S, and Robert, M. (2020) ‘From anatomy to patient experience in pelvic floor surgery: Mindlines, evidence, responsibility, and transvaginal mesh’, *Social Science and Medicine*, 260. doi: 10.1016/j.socscimed.2020.113151

Duke University Medical Center Library and Archives (2019) *EBP Tutorial: Introduction to EBP*. Available at: https://tutorials.mclibrary.duke.edu/ebpintro/. (Accessed: 28 November 2022)

Eccles, M.P. and Mittman, B.S (2006) ‘Welcome to Implementation Science’, *Implementation Science*. doi: 10.1186/1748-5908-1-1

Elliott, S. A., Dyson, M. P., Wilkes, G. V., Zimmermann, G. L., Chambers, C. T., Wittmeier, K. D., … Hartling, L. (2020) 'Considerations for health researchers using social media for knowledge translation: Multiple case study', *Journal of Medical Internet Research*, 22(7). Article e15121. doi: 10.2196/15121

Emmel, N. (2013) *Sampling and choosing cases in qualitative research: a realist approach*. SAGE Publications Ltd

Flick, U. (2020) *Introducing Research Methodology*. Third. SAGE Publications Ltd

Frisch, N., Atherton, P., Borycki, E., Mickelson, G., Cordeiro, J., Lauscher, H. N, and Black, A. (2014) 'Growing a professional network to over 3000 members in less than 4 years: Evaluation of InspireNet, British Columbia's virtual nursing health services research network', *Journal of Medical Internet Research*, 16(2). Article e49. doi: 10.2196/jmir.3018

Fuller, C. (2022) *Next steps for integrating primary care: Fuller Stocktake report*. NHS England report. Available at: www.england.nhs.uk/primary-care/next-steps-for-integrating-primary-care-fuller-stocktake-report. (Accessed: 30 November 2022).

Gabbay, J. and le May, A. (2004) 'Primary care Ethnographic study of knowledge management in primary care', *Bmj*, 329(7473). Article 1013. doi: 10.1136/bmj.329.7473.1013

Gabbay, J. and le May, A. (2011) *Practice-based Evidence for Healthcare*. Oxford: Routledge

Gabbay, J. and le May, A. (2016) 'Mindlines: Making sense of evidence in practice', *British Journal of General Practice*, 66(649), pp. 402–403. doi: 10.3399/bjgp16X686221

Gabbay, J., le May, A., Pope, C., Brangan, E., Cameron, A., Klein, J. H, and Wye, L. (2020) 'Uncovering the processes of knowledge transformation: The example of local evidence-informed policy-making in United Kingdom healthcare', *Health Research Policy and Systems*, 18(1). Article number 110. doi: 10.1186/s12961-020-00587-9

Gené-Badia, J., Gallo, P., Cais, J., Sanchez, E., Carrion, C., Arroyo, L, and Aymerich, M. (2016) 'The use of clinical practice guidelines in primary care: professional mindlines and control mechanisms', *Gaceta Sanitaria*, pp. 345–351. doi: 10.1016/j.gaceta.2016.01.005

Ghandora, H., Halperin, D. M, Isenor, J. E., Taylor, B.A., Fullsack, P., Di Castri, A. M, and Halperi, S.A. (2019) 'Knowledge, attitudes, behaviours, and beliefs of healthcare provider students regarding mandatory influenza vaccination', *Human Vaccines and Immunotherapeutics*, pp. 700–709. doi: 10.1080/21645515.2018.1543523

Glasziou, P. and Chalmers, I. (2018) 'Research waste is still a scandal - An essay by Paul Glasziou and Iain Chalmers', *The BMJ*, 363, pp. 10–12. doi: 10.1136/bmj.k4645

Goff, D. A., Kullar, R. and Newland, J. G. (2015) 'Review of twitter for infectious diseases clinicians: Useful or a waste of time?', *Clinical Infectious Diseases*, 60(10), pp. 1533–1540. doi: 10.1093/cid/civ071

Gong, W., Lim, E. P. and Zhu, F. (2015) 'Characterizing silent users in social media communities', *Proceedings of the 9th International AAAI Conference on Web and Social Media*, 9(1), pp. 140–149. doi: 10.1609/icwsm.v9i1.14582

Goodwin, R. W. and Hendrick, P. A. (2016) 'Physiotherapy as a first point of contact in general practice - a solution to a growing problem', *Primary Health Care Research & Development*, 17, pp. 489–502. doi: 10.1017/S1463423616000189

Goodwin, R., Moffatt, F., Hendrick, P and Logan, P. (2017) 'Sociocultural challenges faced in implementing self-referral physiotherapy in primary care – a qualitative evaluation of staff opinions', *Physiotherapy*, 103, e6. doi:

10.1016/j.physio.2017.11.157

Goodwin, R., Moffatt, F., Hendrick, P., Stynes, S., Bishop, A. and Logan, P. (2021) ‘Evaluation of the First Contact Physiotherapy (FCP) model of primary care - a qualitative insight’, *Physiotherapy*, 113, pp 209-216. doi: 10.1016/j.physio.2021.08.003

Goodwin, R., Moffatt., F, Hendrick, P., Timmons, S., Chadborn, N, and Logan, P. (2020) ‘First point of contact physiotherapy; a qualitative study’, *Physiotherapy*, 108, pp. 29–36. doi: 10.1016/j.physio.2020.02.003

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W. and Robinson, N. (2006) ‘Lost in knowledge translation: time for a map?’, *The Journal of continuing education in the health professions*, 26(1), pp. 13–24. doi: 10.1002/chp.47

Grajales, F. J., Sheps, S., Ho, K., Novak-Lauscher, H. and Eysenbach, G. (2014) ‘Social media: A review and tutorial of applications in medicine and health care’, *Journal of Medical Internet Research*, 16(2). Article e13. doi: 10.2196/jmir.2912

Grant, A., Sullivan, F. and Dowell, J. (2013) ‘An ethnographic exploration of influences on prescribing in general practice: why is there variation in prescribing practices?’, *Implementation Science,* 8 (72). doi: doi.org/10.1186/1748-5908-8-72

Gray, D. E. (2009) *Doing research in the real world*. Second. London: SAGE Publications Ltd

Green, L. W., Ottoson, J. M., Garcia, C. and Hiatt, R.A. (2009) ‘Diffusion theory and knowledge dissemination, utilization, and integration in public health’, *Annual Review of Public Health*, 30, pp. 151–174. doi: 10.1146/annurev.publhealth.031308.100049

Greenhalgh, S., Selfe, J. and Yeowell, G. (2020) 'A qualitative study to explore the experiences of first contact physiotherapy practitioners in the NHS and their experiences of their first contact role', *Musculoskeletal Science and Practice*, 50. Article 102267. doi: 10.1016/j.msksp.2020.102267

Greenhalgh, T. (2010) 'What is this knowledge that we seek to "exchange"?', *Milbank Quarterly*, 88(4), pp. 492–499. doi: 10.1111/j.1468-0009.2010.00610.x

Greenhalgh, T., Howick, J., Maskrey, N. (2014) ' Evidence based medicine: a movement in crisis?', BMJ, 348, g3725. doi: 10.1136/bmj.g3725

Greenhalgh, T., Jackson, C., Shaw, S. and Janamian, T. (2016) 'Achieving Research Impact Through Co-creation in Community-Based Health Services: Literature Review and case Study', *The Milbank Quarterly*, 94(2), pp. 392–429. doi: 10.1111/1468-0009.12197

Grimshaw, J. M, Eccles, M. P., Lavis, J. N., Hill, S.J. and Squires, J. E. (2012) 'Knowledge translation of research findings', *Implementation Science*, 7(1). Article 50. doi: 10.1186/1748-5908-7-50

Grindell, C., Coates, E., Croot, L., O'Cathain, A. (2022) 'The Use of Co-production, Co-design and Co-creation to Mobilise Knowledge in the Management of Health Conditions: A Systematic Review,' *BMC Health Services Research,* 22(877). doi: 10.1186/s12913-022-08079-y

Grove, A. (2017) *A Multicentre Case Study of Evidence-Based Decision-Making : Exploring the Process of Knowledge Mobilisation in NHS Orthopaedic Practice*. PhD thesis. University of Warwick. Available at: http://wrap.warwick.ac.uk/99177/1/WRAP_Theses_Grove_2017.pdf (Accessed: 12 June 2022)

Guyatt, G., Korff, M. V., Kola, L., Demyttenaere, K., He, Y., Posada-Villa, J., … Alonso, J. (1992) 'Evidence-Based Medicine - A new approach to teaching the practice of medicine', *JAMA*, 268(17), pp. 2420–2425. doi: 10.1001/jama.1992.03490170092032

Haas, A. (2015) 'Crowding at the frontier: boundary spanners, gatekeepers and knowledge brokers', *Journal of Knowledge Management*, 19(5), pp. 1029–1047. doi: 10.1108/JKM-01-2015-0036

Halls, S., Thomas, R., Stott, H., Cupples, M. E., Kersten, P., Cramp, F., … Walsh, N. (2020) 'Provision of first contact physiotherapy in primary care across the UK: a survey of the service', *Physiotherapy,* 108, pp. 2–9. doi: 10.1016/j.physio.2020.04.005

Hanks, R. G., Eloi, H. and Stafford, L. (2019) 'Understanding how advanced practice registered nurses function as patient advocates', *Nursing Forum*, 54(2), pp. 213–219. doi: 10.1111/nuf.12319

Hanney, S. R., Castle-Clarke, S., Grant, J., Guthrie, S., Henshall, C., Mestre-Ferrandiz, J., … Wooding, S. (2015) 'How long does biomedical research take? Studying the time taken between biomedical and health research and its translation into products, policy, and practice', *Health Research Policy and Systems*, 13(1). Article 1. doi: 10.1186/1478-4505-13-1

Harvey, G. and Kitson, A (2016) 'PARIHS revisited: From heuristic to integrated framework for the successful implementation of knowledge into practice', *Implementation Science*, 11(1). doi: 10.1186/s13012-016-0398-2

Health Education England (2017) *Multi-professional framework for advanced clinical practice in England* Available at: https://advanced-practice.hee.nhs.uk/multi-professional-framework-for-advanced-clinical-practice-in-england/ (Accessed: 30 November 2022)

Health Education Englad (2021a) *First Contact Practitioners and Advanced Practitioners in Primary Care: (Musculoskeletal). A Roadmap to Practice.*

Available at: https://www.hee.nhs.uk/sites/default/files/documents/MSK%20July21-FILLABLE%20Final%20Aug%202021_2.pdf (Accessed: 4 Februry 2023)

Health Education England (2021b) *First Contact Practitioners and Advanced Practitioners in Primary Care: (Paramedic)*. Available at: https://www.hee.nhs.uk/sites/default/files/documents/Paramedics%20roadmap%20Final%20Aug%202021_0.pdf (Accessed: 15 November 2021)

Hebron, C. (2018) 'Physiotherapy Past, Present and Future. Embracing the Digital Age: Physiotherapy and Social Media,' *Pain and Rehabilitation. The Journal of the Physiotherapy Pain Association,* 45, pp. 3-6. Available at: https://www.ingentaconnect.com/content/ppa/pr/2018/00002018/00000045/art00002# (Accessed: 8 February 2023)

Hoffmann-Longtin, K., Kerr, A. M., Shaunfield, S., Koenig, C. J., Bylund, C. L. and Clayton, M. F. (2020) 'Fostering Interdisciplinary Boundary Spanning in Health Communication: A Call for a Paradigm Shift', *Health Communication*, 37(5), pp. 568-576. doi: 10.1080/10410236.2020.1857517

Hogg, M. A. and Vaughan, G. M. (2018) *Social Psychology*. Eighth. Harlow: Pearson Education Ltd

Holmes, B., Best, A., Davies, H., Hunter, D., Kelly, M., Marshall, M., Ryecroft-Malone, J. (2017) 'Mobilising knowledge in complex health systems: A call to action' , *Evidence & Policy*, 13(3), pp539-560. doi: 10.1332/174426416X14712553750311

Hutchinson, A. (2016) *Images, GIFs or Video - Which Generates the Most Response on Twitter?* Available at: https://www.socialmediatoday.com/social-business/images-gifs-or-video-which-generates-most-response-twitter (Accessed: 12 November 2021)

Ibrahim, A. M., Lillemoe, K. D., Klingensmith, M. E. and Dimick, J. (2017) ‘Visual abstracts to disseminate research on social media. A prospective, case-control crossover study’, *Annals of Surgery*, 266(6), pp e46-e48. doi: 10.1097/SLA.0000000000002277

Ingram, S., Stenner, R., Acton, T. and Armitage, K. (2020) ‘Implementation of a provider based musculoskeletal first contact physiotherapy service model -Key points to consider’, *Musculoskeletal Care*, 19(2), pp. 231–234. doi: 10.1002/msc.1527

Ingram, S., Stenner, R., May, S. (2023) ‘The experiences of uncertainty amongst musculoskeletal physiotherapists in first contact practitioner roles within primary care’, *Musculoskeletal Care*, pp 1-11. doi: 10.1002/msc.1735

Ivers, N. M. and Grimshaw, J. M. (2016) ‘Reducing research waste with implementation laboratories’, *The Lancet*, 388(10044), pp. 547–548. doi: 10.1016/S0140-6736(16)31256-9

Jacobson, N., Butterill, D. and Goering, P. (2003) ‘Development of a framework for knowledge translation: Understanding user context’, *Journal of Health Services Research and Policy*, 8(2), pp. 94–99. doi: 10.1258/135581903321466067

Jinks, C., Carter, P., Rhodes, C., Taylor, R., Beech, R., Dziedzic, K., … Ong, B. N. (2016) ‘Patient and public involvement in primary care research - An example of ensuring its sustainability’, *Research Involvement and Engagement*, 2(1), pp. 1–12. doi: 10.1186/s40900-016-0015-1

Jones, C., Payne, K., Gannon, B. and Verstappen, S. (2016) ‘Economic Theory and Self-Reported Measures of Presenteeism in Musculoskeletal Disease’, *Current Rheumatology Reports*, 18(8). Article 53. doi: 10.1007/s11926-016-0600-1

Jun, Y., Meng, R. and Johar, G. V. (2017) ‘Perceived social presence reduces fact-checking’, *Proceedings of the National Academy of Sciences of the United*

States of America, 114(23), pp. 5976–5981. doi: 10.1073/pnas.1700175114

Kemp, S (2022) *Digital 2022: July Global Statshot.* Available at: https://datareportal.com/reports/digital-2022-july-global-statshot (Accessed: 6 January 2023)

Khalil, H. (2016) ‘Knowledge translation and implementation science: What is the difference?’, *International Journal of Evidence-Based Healthcare*, 14(2), pp. 39–40. doi: 10.1097/XEB.0000000000000086

Kimmerle, J., Moskaliuk, J., Oeberst, A. and Cress, U. (2015) ‘Learning and Collective Knowledge Construction With Social Media : A Process-Oriented Perspective’, *Educational Psychologist*, 50(2), pp. 120–137. doi: 10.1080/00461520.2015.1036273

Kind, T., Patel, P. D. and Lie, D. A. (2013) ‘Opting in to online professionalism: social media and pediatrics’, *Pediatrics*, 132(5), pp. 792–795. doi: 10.1542/peds.2013-2521

King, R., Sanders, T. and Tod, A. (2021) ‘Shortcuts in knowledge mobilization : An ethnographic study of advanced nurse practitioner discharge decision- -making in the emergency department’, *Journal of Advanced Nursing*, 77(7), pp. 3156–3167. doi: 10.1111/jan.14834

Kislov, R., Hodgson, D. E. and Boaden, R. (2015) ‘Professionals as Knowledge Brokers: The Limits of Authority in Healthcare Collaboration’, *Academy of Management Proceedings*, 2015(1), pp. 11099–11099. doi: 10.5465/ambpp.2015.11099abstract

Kislov, R., Wilson, P. and Boaden, R. (2017) ‘The “dark side” of knowledge brokering’, *Journal of Health Services Research and Policy*, 22(2), pp. 107–112. doi: 10.1177/1355819616653981

Kitzinger, J. (1995) ‘Qualitative research. Introducing Focus Groups’, *BMJ*, 311(7000), pp 299-302. doi: 10.1136/bmj.311.7000.299

Klaic, M., Kapp, S., Hudson, P., Chapman, W., Denehy, L., Story, D. and Francis, J. J. (2022) ‘Implementability of healthcare interventions: an overview of reviews and development of a conceptual framework’, *Implementation Science*, 17(1), pp. 1–20. doi: 10.1186/s13012-021-01171-7

Kleinman, Z. (2022) *Is this really the end of Twitter?*, *BBC News*. Available at: https://www.bbc.co.uk/news/technology-63675849 (Accessed: 28 November 2022)

Knowles, S. E., Allen, D., Donnelly, A., Flynn, J., Gallacher, K., Lewis, A., … Drinkwater, J. (2021) ‘More than a method: trusting relationships, productive tensions, and two-way learning as mechanisms of authentic co-production’, *Research Involvement and Engagement*, 7(1). Article 34. doi: 10.1186/s40900-021-00262-5

Kothari, A., Rudman, D., Dobbins, M., Rouse, M., Sibbald, S. and Edwards, N. (2012) ‘The use of tacit and explicit knowledge in public health’, *Implementation Science*, 7(20), pp. 574–582. doi: 10.1186/1748-5908-7-20

Lackovic, N., Kerry, R., Lowe, R and Lowe, T. (2017) ‘Being knowledge, power and profession subordinates: Students' perceptions of Twitter for learning’, *The Internet and Higher Education*, 33, pp. 41-48. doi: https://doi.org/10.1016/j.iheduc.2016.12.002

Lakshman, M., Sinha, L., Biswas, M., Charles, M. and Arora, N. K. (2000) ‘Quantitative Vs Qualitative Research Methods’, *Indian Journal of Paedeatrics*, 67(5), pp. 369–77. doi: 10.1007/BF02820690

Lamont, T., Barber, N., de Pury, J., Fulop, N., Garfield-Birkbeck, S., Lilford, R., … Fitzpatrick, R. (2016) ‘New approaches to evaluating complex health and care systems’, *BMJ (Online)*, 352(154), pp. 1–5. doi: 10.1136/bmj.i154

Lander, B. and Balka, E. (2019) ‘Exploring how evidence is used in care through an organizational ethnography of two teaching hospitals’, *Journal of Medical Internet Research*, 21(3), pp. 1–9. doi: 10.2196/10769

Langley, J., Wolstenholme, D. and Cooke, J. (2018) ‘“Collective making” as knowledge mobilisation: The contribution of participatory design in the co-creation of knowledge in healthcare’, *BMC Health Services Research*, 18(1), pp. 1–10. doi: 10.1186/s12913-018-3397-y

Langridge, N. (2019) ‘The skills, knowledge and attributes needed as a first-contact physiotherapist in musculoskeletal healthcare’, *Musculoskeletal Care*, 17(2), pp. 253–260. doi: 10.1002/msc.1401

Latane, B., Williams, K. and Harkins, S. (1979) ‘Many Hands Make Light the Work : The Causes and Consequences of Social Loafing’, *Journal of Personality and Social Psychology*, 37(6), pp. 822–832. doi: 10.1037/0022-3514.37.6.822

Lau, R., Stevenson, F., Ong, B. N., Dziedzic, K., Treweek, S., Eldridge, S., … Murray, E. (2016) ‘Achieving change in primary care—causes of the evidence to practice gap: systematic reviews of reviews’, *Implementation Science*, 11. Article 40. doi: 10.1186/s13012-016-0396-4

Lave, J. and Wenger, E. (1991) *Situated learning: Legitimate peripheral participation*. London: Cambridge University Press

Levin, B. (2008) *Thinking about knowledge mobilization: a discussion paper prepared at the request of the Canadian Council on Learning and the Social Sciences and Humanities Research Council*. Available at: https://www.sshrc-crsh.gc.ca/about-au_sujet/publications/KMb_-_LevinDiscussionPaper_-_E.pdf (Accessed: November 30 2022)

Li, L. C., Grimshaw, J. M., Nielsenm C., Judd, M., Coyte, C. and Graham, I. D. (2009) ‘Evolution of Wenger’s concept of community of practice’, *Implementation*

Science, 4(1), pp. 1–8. doi: 10.1186/1748-5908-4-11

Linkewich, E., Quant, S., Bechard, L. and Donald, M. (2022) ‘Using a Virtual Community of Practice to Support Stroke Best Practice Implementation: Mixed Methods Evaluation’, *JMIR Formative Research*, 6(4). Article e31827. doi: 10.2196/31827

Little, J. S. and Romee, R. (2020) ‘Tweeting from the Bench: Twitter and the Physician-Scientist Benefits and Challenges’, *Current Hematologic Malignancy Reports*, pp. 419–423. doi: 10.1007/s11899-020-00601-5

Lobe, B., Morgan, D. and Hoffman, K. A. (2020) ‘Qualitative Data Collection in an Era of Social Distancing’, *International Journal of Qualitative Methods*, 19, pp. 1–8. doi: 10.1177/1609406920937875

Locock, L. and Boaz, A. (2019) ‘Drawing straight lines along blurred boundaries: Qualitative research, patient and public involvement in medical research, co-production and co-design’, *Evidence and Policy*, 15(3), pp. 409–421. doi: 10.1332/174426419X15552999451313

Löhr, K., Weinhardt, M. and Sieber, S. (2020) ‘The “World Café” as a Participatory Method for Collecting Qualitative Data’, *International Journal of Qualitative Methods*, 19, pp. 1–15. doi: 10.1177/1609406920916976

Lomas, J. (1993) ‘Diffusion, Dissemination, and Implementation: Who Should Do What?’, *Annals New York Academy of Sciences*, 703(1), pp. 226–237. doi: 10.1111/j.1749-6632.1993.tb26351.x

Lomas, J. (2000) ‘Using ‘linkage and exchange’ to move research into policy at a Canadian foundation’, *Health Affairs,* 19(3), pp 236-240. doi: 10.1377/hlthaff.19.3.236

Lowe, C. J. M. and Bithell, C. P. (2000) ‘Musculoskeletal Physiotherapy in Primary Care sites’, *Physiotherapy*, 86(9), pp 479-485. Available at:

https://doi.org/10.1016/S0031-9406(05)60810-3

Ludvigsson, M. L. and Enthoven, P. (2012) ‘Evaluation of physiotherapists as primary assessors of patients with musculoskeletal disorders seeking primary health care’, *Physiotherapy*, 98(2), pp. 131–137. doi: 10.1016/j.physio.2011.04.354

Malterud, K., Siersma, V. D. and Guassora, A. D. (2016) ‘Sample Size in Qualitative Interview Studies’, *Qualitative Health Research*, pp. 1753–1760. doi: 10.1177/1049732315617444

Markham, M. J., Gentile, D. and Graham, D. L. (2020) ‘Social Media for Networking, Professional Development, and Patient Engagement’, *American Society of Clinical Oncology Educational Book*, (37), pp. 3–8. doi: 10.1200/edbk_180077

Marques, I. C. D. S., Theiss, L. M., Johnson, C. Y., McLin, E., Ruf, B.A., Vickers, S.M., … Chu, D. I. (2021) ‘Implementation of virtual focus groups for qualitative data collection in a global pandemic’, *The American Journal of Surgery*, 388(221), pp. 918–922. doi: 10.1016/j.amjsurg.2020.10.009

Martinez-Mesa, J., Gonzalez-Chica, D. A., Duquia, R., Bonamigo, R. R. and Bastos, J. L. (2016) ‘Sampling: how to select participants in my research study?’, *An Bras Dermatol*, 91(3), pp. 326–30. doi: 10.1590/abd1806-4841.20165254

Martini, K. and Kelly, R. (2017) ‘The provision of first contact physiotherapy in GP surgeries with non-advanced practice clinicians: a service evaluation’, *Physiotherapy*, 103(1), pp. e31 doi: 10.1016/j.physio.2017.11.192

May, C. and Finch, T. (2009) ‘Implementing, embedding, and integrating practices: An outline of normalization process theory’, *Sociology*, 43(3), pp. 535–554. doi: 10.1177/0038038509103208

Mccoll, M. A., Aiken, A., Smith, K., McColl, A., Green, M., Godwin, M., … Schaub, M. (2015) ‘Actionable nuggets: knowledge translation tool for the needs of patients with spinal cord injury’, *Canadian Family Physician*, 61(5), e240–e248.

Available at: https://pubmed.ncbi.nlm.nih.gov/26167564/ (Accessed: 25 November 2022)

McErlane, F., Armitt, G., Cobb, J., Bailey, K., Cleary, G., Douglads, S. … Thomson, W. (2020) ‘CAPTURE-JIA: a consensus-derived core dataset to improve clinical care for children and young people with juvenile idiopathic arthritis’, *Rheumatology,* 59(1), pp. 137–145. doi: 10.1093/rheumatology/kez214

McLoughlin, C., Patel, K. D., O’Callaghan, T. and Reeves, S. (2018) ‘The use of virtual communities of practice to improve interprofessional collaboration and education: findings from an integrated review’, *Journal of Interprofessional Care*, 32(2), pp. 136–142. doi: 10.1080/13561820.2017.1377692

Mickan, S., Burls, A. and Glasziou, P. (2011) ‘Patterns of “leakage” in the utilisation of clinical guidelines: A systematic review’, *Postgraduate Medical Journal*, 87(1032), pp. 670–679. doi: 10.1136/pgmj.2010.116012

Modgil, S., Singh, R. K., Gupta, S. and Dennehy, D. (2021) ‘A Confirmation Bias View on Social Media Induced Polarisation During COVID-19’, *Information Systems Frontiers*, pp. 1-25. doi: 10.1007/s10796-021-10222-9

Moffatt, F., Goodwin, R. and Hendrick, P. (2018) ‘Physiotherapy as first point of contact service for patients with muscuskeletal complaints - understanding the challenges of implementation’, *Primary Health Care Research & Development*, 19(2), pp. 121–130. doi: 10.1017/S1463423617000615

Mohammadi, E., Thelwall, M., Kwasny, M. and Holmes, K. L. (2017) ‘Academic information on Twitter: A user survey’, *PLoS One*. 13(5). Article e0197265. doi: doi.org/10.1371/journal.pone.0197265

Morris, L., Moule, P., Pearson, J., Foster, D. and Walsh, N. (2021) ‘Patient acceptability of the physiotherapy first contact practitioner role in primary care: A realist informed qualitative study’, *Musculoskeletal Care*, 19(1), pp. 38–51. doi:

10.1002/msc.1505

Morris, Z. S., Wooding, S. and Grant, J. (2011) ‘The answer is 17 years, what is the question - understanding time lags in translational research’, *J R Soc Med*, 104(12), pp. 510–520. doi: 10.1258/jrsm.2011.110180

Muller, M. (2012) ‘Lurking as personal trait or situational disposition? Lurking and contributing in enterprise social media’, *Proceedings of the ACM Conference on Computer Supported Cooperative Work, CSCW*, pp. 253–256. doi: 10.1145/2145204.2145245

Munro, C. L. and Savel, R. H. (2016) ‘Narrowing the 17 year research to practice gap’, *American Journal of Critical Care*, 25(3), pp. 194–196. doi: 10.4037/ajcc2016449

Murad, M. H., Asi, N., Alsawas, M. and Alahdab, F. (2016) ‘New evidence pyramid’, *Evidence Based Medicine*, 21(4), pp.125-127. doi: http://dx.doi.org/10.1136/ebmed-2016-110401

Murray, C. J. L. (2018) ‘Global, regional, and national incidence, prevalence, and years lived with disability for 354 Diseases and Injuries for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017’, *The Lancet*, 392(10159), pp. 1789–1858. doi: 10.1016/S0140-6736(18)32279-7

National Institute for Health and Care Excellence (2016) *Multimorbidity: clinical assessment and management*, Available at: https://www.nice.org.uk/guidance/ng56 (Accessed: 30 November 2022).

National Institute for Health and Care Excellence (2022) *Clinical Knowledge Summaries*. Available at: https://cks.nice.org.uk/ (Accessed: 30 November 2022)

NHS England (2014) *Five Year Forward View*. Available at:

https://www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf (Accessed: 11 November 2021)

NHS England (2016) *General Practice Forward View*, *Online*. Available at: https://www.england.nhs.uk/gp/gpfv/ (Accessed: 11 November 2021)

NHS England (2019) *The NHS Long Term Plan*. Available at: www.longtermplan.nhs.uk (Accessed: 11 November 2021)

NIHR (2019) *UK Standards for Public Involvement*. Available at: https://sites.google.com/nihr.ac.uk/pi-standards/home (Accessed: 30 November 2022)

Nilsen, P. (2015) 'Making sense of implementation theories, models and frameworks', *Implementation Science*, 10(1), pp. 1–13. doi: 10.1186/s13012-015-0242-0

Nonaka, I. and Georg von Krogh (2009) 'Tacit knowledge and knowledge conversion: controversy and advancement in organisational knowledge creation theory', *Organisation Science*, 20(3), pp. 635–652. doi: 10.1287/orsc.1080.0412

Nonaka, I. and Takeuchi, H. (1995) *The Knowledge-Creating company*. New York: Oxford University Press

O'Day, E. B. and Heimberg, R. G. (2021) 'Social media use, social anxiety, and loneliness: A systematic review', *Computers in Human Behavior Reports*, 3. Article 100070. doi: 10.1016/j.chbr.2021.100070

Office for National Statistics (2019) *Sickness absence in the UK labour market:2018*, *Office of National Statistics*. Available at: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/labourproductivity/articles/sicknessabsenceinthelabourmarket/2018 (Accessed: 11 January 2021)

Office for National Statistics (2020) *Internet access – households and individuals, Great Britain: 2020*. Available at:

https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/bulletins/internetaccesshouseholdsandindividuals/2020 (Accessed: 30 November 2022)

Ordenes, F. V., Grewal, D., Ludwig, S., Ruyter, K. D., Mahr, D. and Wetzels, M. (2019) ‘Cutting through Content Clutter: How speech and image acts drive consumer sharing of social media brand messages’, *Journal of Consumer Research*, 45(5), pp. 988–1012. doi: 10.1093/jcr/ucy032

Padalia, D. (2014) ‘Conformity Bias : A Fact or an Experimental Artifact ?’, 59, pp. 223–230. doi: 10.1007/s12646-014-0272-8

Panahi, S., Watson, J. and Partridge, H. (2012) ‘Potentials of social media for tacit knowledge sharing amongst physicians: Preliminary findings’, *23rd Australasian Conference on Information Systems*, pp. 1–10. Available at: https://www.researchgate.net/publication/264355134_Potentials_of_Social_Media_for_Tacit_Knowledge_Sharing_Amongst_Physicians_Preliminary_Findings (Accessed: 20 September 2021)

Panahi, S., Watson, J. and Partridge, H. (2016) ‘Social media and physicians: Exploring the benefits and challenges’, *Health Informatics Journal*, 22(2), pp. 99–112. doi: 10.1177/1460458214540907

Parsons, S., Ingram, M., Clarke-Cornwell, A. and Symmons, D. (2011) *A heavy burden: The occurrence and impact of musculoskeletal conditions in the United Kingdom today.* Available at: https://www.escholar.manchester.ac.uk/api/datastream?publicationPid=uk-ac-man-scw:123774&datastreamId=FULL-TEXT.PDF (Accessed: 30 November 2022)

Pershad, Y., Hangge, P.T., Albadawi, H. and Oklu, R. (2018) ‘Social Medicine: Twitter in Healthcare’, *Journal of Clinical Medicine*, 7(6), p. 121. doi:

10.3390/jcm7060121

Petty, N. J., Thomson, O. P. and Stew, G. (2012) ‘Ready for a paradigm shift? Part 2: Introducing qualitative research methodologies and methods’, *Manual Therapy*, 17(5), pp. 378–384. doi: 10.1016/j.math.2012.03.004

Phipps, D. J., Jensen, K. E. and Myers, J. G. (2012) ‘Applying Social Sciences Research for Public benefit Using Knowledge Mobilization and Social Media’, in Asuncion Lopez-Varela (ed.) *Theoretical and Methodological Approaches to Social Sciences and Knowledge Management*. InTech, pp. 179–209. doi: 10.5772/37533

Pizzuti, A. G., Patel, K. H., McCreary, E. K., Heil, E., Bland, C. M., Chinaeke, E., … Bookstaver, P. B. (2020) ‘Healthcare practitioners’ views of social media as an educational resource’, *PLoS ONE*, 15(2), pp. 1–16. doi: 10.1371/journal.pone.0228372

Pope, C., May, A. le and Gabbay, J. (2008) ‘Chasing Chameleons, Chimeras and Caterpillars: Evaluating an Organizational Innovation in the National Health Service’, in Mckee, L., Ferlie, E., and Hyde, P. (eds) *Organizing and reorganizing: Power and change in health care organizations*. London: Pelgrave Macmillan. doi: 10.1057/9780230583207_9

Popovac, M. and Fullwood, C. (2018) ‘The Psychology of Online Lurking’, in Attrill-Smith, A., Fullwood, C., Keep, M. and Kuss, D. J. (eds) *The Oxford Handbook of Cyberpsychology*. Oxford University Press pp. 285–305

Powell, A., Davies, H. T. O. and Nutley, S. M. (2017) ‘Facing the challenges of research-informed knowledge mobilization: “Practising what we preach”?’, *Public Administration*, 96(1), pp. 36–52. doi: 10.1111/padm.12365

Public Health England (2019) *Musculoskeletal Health : A 5 year strategic framework for prevention across the lifecourse*. Available at:

https://www.gov.uk/government/publications/musculoskeletal-health-5-year-prevention-strategic-framework (Accessed: 30 November 2022)

Quicke, J. G., Conoghan, P. G., Corp, N. and Peat, G. (2022) ‘Osteoarthritis year in review 2021: epidemiology & therapy’, *Osteoarthritis and Cartilage*, 30(2), pp. 196–206. doi: 10.1016/j.joca.2021.10.003

Renjith, V., Yesodharan, R., Noronha, J. A., Ladd, E. and George, A. (2021) ‘Qualitative Methods in Health Care Research’, *International Journal of Preventive Medicine*, 12(20), pp. 1–7. doi: 10.4103/ijpvm.IJPVM

Restall, G., Diaz, F. and Wittmeier, K. (2020) ‘Why Do Clinical Practice Guidelines Get Stuck during Implementation and What Can Be Done: A Case Study in Pediatric Rehabilitation’, *Physical and Occupational Therapy in Pediatrics*, pp. 217–230. doi: 10.1080/01942638.2019.1660447

Robinson, P. and Lowe, J. (2015) ‘Literature reviews vs systematic reviews’, *Australian and New Zealand Journal of Public Health*, 39(2), p. 103. doi: 10.1111/1753-6405.12393

Rolfe, G. (2006) ‘Methodology Issues in Nursing Research: Validity, Trustworthiness and Rigour: Quality and The Idea of Qualitative Research’, *Journal of Advanced Nursing*, 53(3), pp. 304–310.

Rolls, K., Hansen, M., Jackson, D. and Elliott, D. (2016) ‘How health care professionals use social media to create virtual communities: An integrative review’, *Journal of Medical Internet Research*, 18(6). Article e166. doi: 10.2196/jmir.5312

Rowley, J. (2007) ‘The wisdom hierarchy: Representations of the DIKW hierarchy’, *Journal of Information Science*, 33(2), pp. 163–180. doi: 10.1177/0165551506070706

Rubinger, L., Gazendam, A., Ekhtiari., Nucci, N., Payne, A., Johal, H., … Bhandari M. (2020) ‘Maximizing virtual meetings and conferences: a review of best practices’, *International Orthopaedics*, 44(8), p. 1461-1466. doi: 10.1007/s00264-020-04615-9

Rushmer, R., Ward, V., Nguyen, T., Kuchenmüller, T. (2019). ‘Knowledge Translation: Key Concepts, Terms and Activities’, in Verschuuren, M. and van Oers, H. (eds), *Population Health Monitoring*. Springer, Cham. Pp127 – 150. doi: 10.1007/978-3-319-76562-4_7

Russell, J., Fudge, N. and Greenhalgh, T. (2020) ‘The impact of public involvement in health research : what are we measuring ? Why are we measuring it ? Should we stop measuring it ?’, *Research Involvement and Engagement,* 6(63). pp. 4–11. doi: 10.1186/s40900-020-00239-w

Rycroft-Malone, J., Burton, C.R., Wilkinson, J., Harvey, G., McCormack, B., Baker, R., … Melville-Richards, L. (2016) ‘Collective action for implementation: a realist evaluation of organisational collaboration in healthcare’, *Implementation Science,* 11(1). doi: 10.1186/s13012-016-0380-z

Sabus, C., Johns, B., Schultz, N. and Gagnon, K. (2019) ‘Exploration of Content and Reach of Physical Therapy-Related Discussion on Twitter’, *Physical Therapy*, 99(8). pp. 1048–1055. doi: 10.1093/ptj/pzz063

Sackett, D., Rosenberg, W. M., Gray, J. A., Haynes, R. B., Richardson, W. S. (1996) ‘Evidence based medicine: what it is and what it isn’t’, *BMJ*, 312, pp. 71–72. doi: 10.1136/bmj.312.7023.71

Saunders, B., Foster, N. E., Hill, J. C., Sowden, G., Evans, N., Bishop, A., … Wynne-Jones, G. (2021) ‘First Contact Practitioners ’ (FCPs) and General Practitioners ’ Perceptions Towards FCPs Delivering Vocational Advice to Patients with Musculoskeletal Conditions : A Qualitative Investigation of the Implementation Potential of the I - SWAP Initiative’, *Journal of Occupational Rehabilitation*, 32(1), pp.147-155. doi: 10.1007/s10926-021-09992-5

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., … Jinks, C. (2017) ‘Saturation in qualitative research: exploring its conceptualization and operationalization’, *Quality & Quantity*, 52(4), pp. 1893–1907. doi: 10.1007/s11135-017-0574-8

Sedysheva, A. (2020) ‘Doing Qualitative Research during the Covid-19 Pandemic of 2020’, *Ask: Research and Methods*, 29(1), pp. 75–88. doi: 10.18061/ask.v29i1.0005

Shaw, L., Jazayeri, D., Kiegaldie, D. and Morris, M. (2021) ‘Virtual Communities of Practice to improve clinical outcomes in healthcare: protocol for a 10-year scoping review’, *BMJ Open*, 11(7). Article e046998. doi: 10.1136/bmjopen-2020-046998

Sibbald, S. L., Burnet, M. L., Callery, B. and Mitchell, J. I. (2022) ‘Building a virtual community of practice: experience from the Canadian foundation for healthcare improvement’s policy circle’, *Health Research Policy and Systems*, 20(1). Article 95. doi: 10.1186/s12961-022-00897-0

Silverman, D. (2017) *Doing Qualitative Research*. Fifth. UK: SAGE Publications Ltd.

Soper, B., Yaqub, O., Hinrichs, S., Marjanovich, S., Drabble, S., Hanney, S. and Nolte, E. (2013) ‘CLAHRCs in practice: Combined knowledge transfer and exchange strategies, cultural change, and experimentation’, *Journal of Health Services Research & Policy*, 18(3), pp. 53–64. doi: 10.1177/1355819613499903

Spaulding, S. (2021) ‘Beliefs and biases’, *Springer Nature*, 199, pp. 7575–7594. doi: 10.1007/s11229-021-03129-0

Staniszewska, S., Thomas, V. and Seers, K. (2013) ‘Patient and public involvement in the implementation of evidence into practice’, *Evidence Based Nursing*, 16(5), p. 97. doi: 10.1136/eb-2013-101510

Stocking, G. and Sumida, N. (2018) *Social Media Bots Draw Public’s Attention and*

Concern Available at: https://www.pewresearch.org/journalism/2018/10/15/social-media-bots-draw-publics-attention-and-concern/ (Accessed: 30 November 2022)

Struminger, B., Sanjeev, A., Zalud-Cerrato, S., Lowrance, D. and Ellerbrock, T. (2017) ‘Building virtual communities of practice for health’, *The Lancet*, 390(10095), pp. 632–634. doi: 10.1016/S0140-6736(17)31666-5

Sturges, J. E. and Hanrahan, K. J. (2003) ‘Comparing telephone and face to face qualitative interviewing: a research note’, *Qualitative Research,* 4(1), pp. 107 - 118. doi: 10.1177/146879410404111

Stynes, S., Goodwin, R. and Bishop, A. (2020) *National Evaluation of First Contact Practitioner (FCP) model of primary care*. Chartered Society of Physiotherapy. Available at: https://www.csp.org.uk/system/files/documents/2020-11/final_fcp_phase_3_national_evaluation_report.pdf (Accessed: 30 November 2020)

Stynes, S., Jordan, K. P., Hill, J. C., Wynne-Jones, G., Cottrell, E., Foster, N. E., … Bishop, A. (2021) ‘Evaluation of the First Contact Physiotherapy (FCP) model of primary care - patient characteristics and outcomes’, *Physiotherapy*, 113, pp. 199-208. doi: 10.1016/j.physio.2021.08.002

Surani, Z., Hirani, R., Elias, A., Quisenberry, L., Varon, J., Surani, S. and Surani, S. (2017) ‘Social media usage among health care providers’, *BMC Research Notes*, 10(1), pp. 1–5. doi: 10.1186/s13104-017-2993-y

Swaithes, L. R., Dziedzic, K., Cottrell, E. and Quicke, J. G. (2019) ‘Response to: Losina E. Why past research successes do not translate to clinical reality: gaps in evidence on exercise program efficiency. osteoarthritis and cartilage 2019;27:1–2’, *Osteoarthritis and Cartilage*, 27(7), pp. e7–e8. doi: 10.1016/j.joca.2019.02.801

Swaithes, L., Dziedzic, K., Finney, A., Cottrell, E., Jinks, C., Mallen, C., Currie, G. and Paskins, Z. (2020) ‘Understanding the uptake of a clinical innovation for osteoarthritis in primary care : a qualitative study of knowledge mobilisation using the i-PARIHS framework’, *Implementation Science*, 15, pp. 1–19. doi: 10.1186/s13012-020-01055-2

Swaithes, L., Dziedzic, K., Sharp, C. A., Ellis, B. and Walsh, N. (2020) ‘Context, context, context: How has covid-19 changed implementation globally and how can we “lock in” learning?’, *Rheumatology (United Kingdom)*, 59(8), pp. 1804–1807. doi: 10.1093/rheumatology/keaa387

Swaithes, L., Walsh, N. and Quicke, J. G. (2021) ‘Are physiotherapists too bound to be boundary spanning?’, *Musculoskeletal Care*, 19(4), pp. 550-554. doi: 10.1002/msc.1544

Sy, M., O’Leary, N., Nagraj, S., El-Awaisi, A., O’Carroll, V. and Xyrichis, A. (2020) ‘Doing interprofessional research in the COVID-19 era: a discussion paper’, *Journal of Interprofessional Care*, 34(5), pp. 600–606. doi: 10.1080/13561820.2020.1791808

Tesser, A. and Shaffer, D. R. (1990) ‘Attitudes and Attitude Change’, *Annual Review of Psychology*, 41 pp. 479–523. doi: 10.1146/annurev.ps.41.020190.002403

Thoma, B., Brazil, V., Spurr, J., Palaganas, J., Eppich, W., Grant, V. and Cheng, A. (2018) ‘Establishing a Virtual Community of Practice in Simulation: The Value of Social Media’, *Simulation in Healthcare*, 13(2), pp. 124–130. doi: 10.1097/SIH.0000000000000284

Thomas, M. J., Rathod-Mistry, T., Parry, E. L., Pope, C., Neogi, T. Peat, G. (2021) ‘Triggers for acute flare in adults with, or at risk of, knee osteoarthritis: a web-based case-crossover study in community-dwelling adults’, *Osteoarthritis and Cartilage*, pp. 956–964. doi: 10.1016/j.joca.2021.04.007

Tidy, J. (2022) *Twitter charity partners condemn Musk's 'dangerous' changes*, *BBC News*. Available at: https://www.bbc.co.uk/news/technology-63710997 (Accessed: 30 November 2022)

Tonkin, E., Pfeiffer, H. D. and Tourte, G. (2012) 'Twitter, information sharing and the London riots?', *Bulletin of the American Society for Information Science and Technology*, 38(2), pp. 49–57. doi: 10.1002/bult.2012.1720380212

Torrentira, Moises C., J. (2020) 'Online Data Collection As Adaptation in Conducting Quantitative and Qualitative Research During the Covid-19 Pandemic', *European Journal of Education Studies*, 7(11). doi: 10.46827/ejes.v7i11.3336

Truong, B., Caragea, C., Squicciarini, L. and Tapia, A.H. (2014) 'Identifying valuable information from Twitter during natural disasters', *Computer Science,* 51(1), pp.1-4. doi: 10.1002/meet.2014.14505101162

Tunnecliff, J., LLic, D., Morgan, P., Keating, J., Gaida, J. E., Clearihan, L., … Maloney, S.. (2015) 'The acceptability among health researchers and clinicians of social media to translate research evidence to clinical practice: Mixed-methods survey and interview study', *Journal of Medical Internet Research*, 17(5). Article e119. doi: 10.2196/jmir.4347

Tunnecliff, J., Weiner, J., Gaida, J. E., Keating, J. L., Morgan, P., LLic, D., … Maloney S. (2017) 'Translating evidence to practice in the health professions: A randomized trial of Twitter vs Facebook', *Journal of the American Medical Informatics Association*, 24(2), pp. 403–408. doi: 10.1093/jamia/ocw085.

Turney, L. and Pocknee, C. (2005) 'Virtual Focus Groups: New Frontiers in Research', *International Journal of Qualitative Methods*, 4(2), pp. 32–43. doi: 10.1177/160940690500400203

University of Miami (2022) *What is Evidence Based Medicine?* Available at: https://sp.library.miami.edu/subjects/Nursing#tab-4 (Accessed: 30 November

2022)

van Kampen, H. S. (2019) ‘The principle of consistency and the cause and function of behaviour’, *Behavioural Processes*, 159, pp. 42–54. doi: 10.1016/j.beproc.2018.12.013

Varma, D. S., Young, M. E., Kreider, C. M., Williams, K., Vaddiparti, K., Parisi, C. and Semeah, L. M. (2021) ‘Practical Considerations in Qualitative Health Research During the COVID-19 Pandemic’, *International Journal of Qualitative Methods*. 20. doi: 10.1177/16094069211043755

Varol, O., Ferrara, E., Davis, C. B., Menczer, F. and Flammini, A. (2017) ‘Online Human-Bot interactions: Detection, Estimation and Characterization’, *Proceedings of the Eleventh International AAAI Conference on Web and Social Media,* pp. 280-289. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3324593 (Accessed: 12 March 2021)

Versus Arthritis (2021) *The State of Musculoskeletal Health 2021*, Available at: https://www.versusarthritis.org/media/24653/state-of-msk-health2-2021.pdf (Accessed: 30 November 2022)

Vindrola-Padros, C., Chisnall, G., Cooper, S., Dowrick, A., Djellouli, N., Symmons, S. M., … Johnson, G. A. (2020) ‘Carrying Out Rapid Qualitative Research During a Pandemic: Emerging Lessons From COVID-19’, *Qualitative Health Research*, 30(14), pp. 2192–2204. doi: 10.1177/1049732320951526

Vos, T., and GBD 2016 Disease and Injury Incidence and Prevalence Collaborators (2017) ‘Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016’, *The Lancet*, 390(10100), pp. 1211–1259. doi: 10.1016/S0140-6736(17)32154-2

Ward, V. (2017) ‘Why, whose, what and how? A framework for knowledge mobilisers’, *Evidence and Policy*, 13(3), pp. 477–497. doi: 10.1332/174426416X14634763278725.

Weiner-Levy, N. and Queder, S. A. R. (2012) ‘Researching my people, researching the “other”: field experiences of two researchers along shifting positionalities’, *Quality & Quantity*, 46, pp. 1151-1166. doi: https://doi.org/10.1007/s11135-012-9677-4

Wekerle, C., Vakili, N., Stewart, S. H., Black, T. (2018) ‘The utility of Twitter as a tool for increasing reach of research on sexual violence’, *Child Abuse and Neglect*, 85, pp. 220–228. doi: 10.1016/j.chiabu.2018.04.019

Wenger, E., McDerott, R. A. and Snyder, W. (2002) *Cultivating Communities of Practice: A guide to Managing Knowledge*. First. Boston: Harvard Business School Press

Whiting, A. and Williams, D. (2013) ‘Why people use social media: a uses and gratifications approach’, *Qualitative Market Research: An International Journal*, 16(4), pp. 362–369. doi: 10.1108/QMR-06-2013-0041

Wieringa, S. and Greenhalgh, T. (2015) ‘10 years of mindlines: A systematic review and commentary’, *Implementation Science*, 10(1), pp. 1–11. doi: 10.1186/s13012-015-0229-x

Wieringa, S., Engebretsen, E., Heggen, K., Greenhalgh, T. (2018) ‘How knowledge is constructed and exchanged in virtual communities of physicians: Qualitative study of mindlines online’, *Journal of Medical Internet Research*, 20(2). doi: 10.2196/jmir.8325

Wilkinson, S. (1998) ‘Focus Groups in Health Research’, *Journal of Health Psychology*, 3(3), pp. 329–348. doi: 10.1177/135910539800300304

Williams, D. (2014) ‘Models, Metaphors and Symbols for Information and Knowledge

Systems’, *Journal of Entrepreneurship, Management and Innovation*, 10(1), pp. 79–107. doi: 10.7341/20141013.

Williamson, D. A. (2022) *Global Social Network Users 2022*. Available at: https://www.insiderintelligence.com/content/global-social-network-users-2022 (Accessed: 30 November 2022)

Wood, L., Bishop, A., Goodwin, R. and Stynes, S. (2021) ‘Patient satisfaction with the first contact physiotherapy service : Results from the national evaluation survey’, *Musculoskeletal Care*, 20(2), pp. 363-370. doi: 10.1002/msc.1599

Wyatt, J. C. (2001) ‘Management of explicit and tacit knowledge’, *Journal of the Royal Society of Medicine*, 94(1), pp. 6–9. doi: 10.1177/014107680109400102

Zadro, J. R., Ferreira, G. E., O’Keeffe, M., Stahl-Timmins, W., Elkins, M. R. and Maher, C. G. (2022) ‘How do people use and view infographics that summarise health and medical research? A cross - sectional survey’, *BMC Medical Education*, 22. Article 677. doi: 10.1186/s12909-022-03744-6

Zahra, S. A. and George, G. (2002) ‘Absorptive Capacity: A Review, Reconceptualization, and Extension’, *The Academy of Management Review*, 27(2), p. 185. doi: 10.2307/4134351

Zhao, J., Harvey, G., Vandyk, A., Huang, M., Hu, J., Modanloo, S. and Gifford, W. (2022) ‘Understanding How and Under What Circumstances Social Media Supports Health Care Providers’ Knowledge Use in Clinical Practice: A Realist Review’, *Telemedicine and e-Health*. (Published online ahead of print) doi: 10.1089/tmj.2022.0213

Ziebland, S. and McPherson, A. (2006) ‘Making sense of qualitative data analysis: An introduction with illustrations from DIPEx (personal experiences of health and illness)’, *Medical Education*, 40(5), pp. 405–414. doi: 10.1111/j.1365-2929.2006.02467.x

Appendix

List of appendices

1) Ethical approval
2) Recruitment advertisements
3) Participant consent form
4) Participant information sheet
5) Topic guide 1 – Twitter users
6) Topic guide 2 – non-Twitter users
7) Considerations when engaging stakeholders
8) Stakeholder Advisory Group contributions and agendas
9) Participant characteristics
10) Examples from reflexive diary
11) Positionality statement
12) Examples of analysis
    a. Extract from memos
    b. Screenshot of coding
    c. Screenshots of initial coding spreadsheets
    d. Table of initial themes 1
    e. Table of initial themes 2
    f. Final themes with examples of coded data
    g. Thematic maps
13) Plain Language Guides

Appendix 1 – Ethical approval

Ethical approval was obtained by Keele University's Faculty of Medicine and Health Sciences Research Ethics Committee (FMHS FREC) 28.10.21 (REC Reference: MH-210199) with no conditions. This document is included below. In order to protect the dignity and safety of participants, ethical principles were considered and followed (Silverman, 2017). These included consideration around risk to the participants and signposting to line managers, colleagues, mentors or professional forums to discuss any arising issues and Keele, NHS and voluntary support services if distress was encountered during the interviews. The study was conducted in line with Keele University Data Protection procedures and all information was kept on the researcher's OneDrive, which is university supported, at rest and in transit encrypted and requires two factor identification for access. The participant information sheet informed the participant that their participation was voluntary and they could withdraw from the study at any time. They were able to request their data to be retracted at any point up to two weeks following the interview date, without giving a reason. If participants withdrew within two weeks of the interview, agreement for quotations to be used in reports of the study could also be withdrawn by contacting the candidate, however this was not necessary. Participants were made aware that after two weeks it would not be possible to delete their data from the study as analysis will have begun. Contact details were not printed or used in paper format and were deleted after the interview had taken place and the two-week withdrawal period finished, however participant codes remained.

The candidate made sure to conduct the interviews in a private, quiet location so that the conversation could not be overheard or interrupted by third parties. This was particularly pertinent given the interviews were conducted over MS Teams, and the candidate carried out the interviews from a private home office. Interviewees could choose where they wanted to take part from, some participants chose to do this in a private clinic room between patients, some were involved from their own homes.

Keele
UNIVERSITY

Keele University FMHS Faculty Research Ethics Committee

g.p.j.moss@keele.ac.uk

28th October 2021

Dear Laura,

Project Title:	Twitter for knowledge mobilisation: Investigating the attitudes, beliefs and behaviours of musculoskeletal (MSK) First Contact Physiotherapists (FCPs)
REC Project Reference:	MH-210199
Type of Application	Main application

Keele University's Faculty of Medicine and Health Sciences Research Ethics Committee (FMHS FREC) reviewed the above project application.

Final Opinion
Thank you for summarising the amendments in a detailed but extremely clear manner. The FMHS FREC can now recommend that this study receives a **Favourable Ethical Opinion**.

Conditions / recommendations:
There are no **conditions** attached to this application. There are, however, standard reporting requirements to consider, below:

Reporting requirements
The University's standard operating procedures give detailed guidance on reporting requirements for studies with a favourable opinion including:

- Notifying the relevant FREC of substantial amendments to an approved study
- Notifying the relevant FREC of issues which may have an impact upon ethical opinion of the study
- Progress reports, as appropriate
- Notifying the relevant FREC of the end of the study

Documents reviewed
The documents reviewed were:

Document	**Version**	**Date**
All documents submitted with MH-210199 including revisions		

Yours sincerely,

Dr Gary Moss
Chair

Appendix 2 – Recruitment advertisements

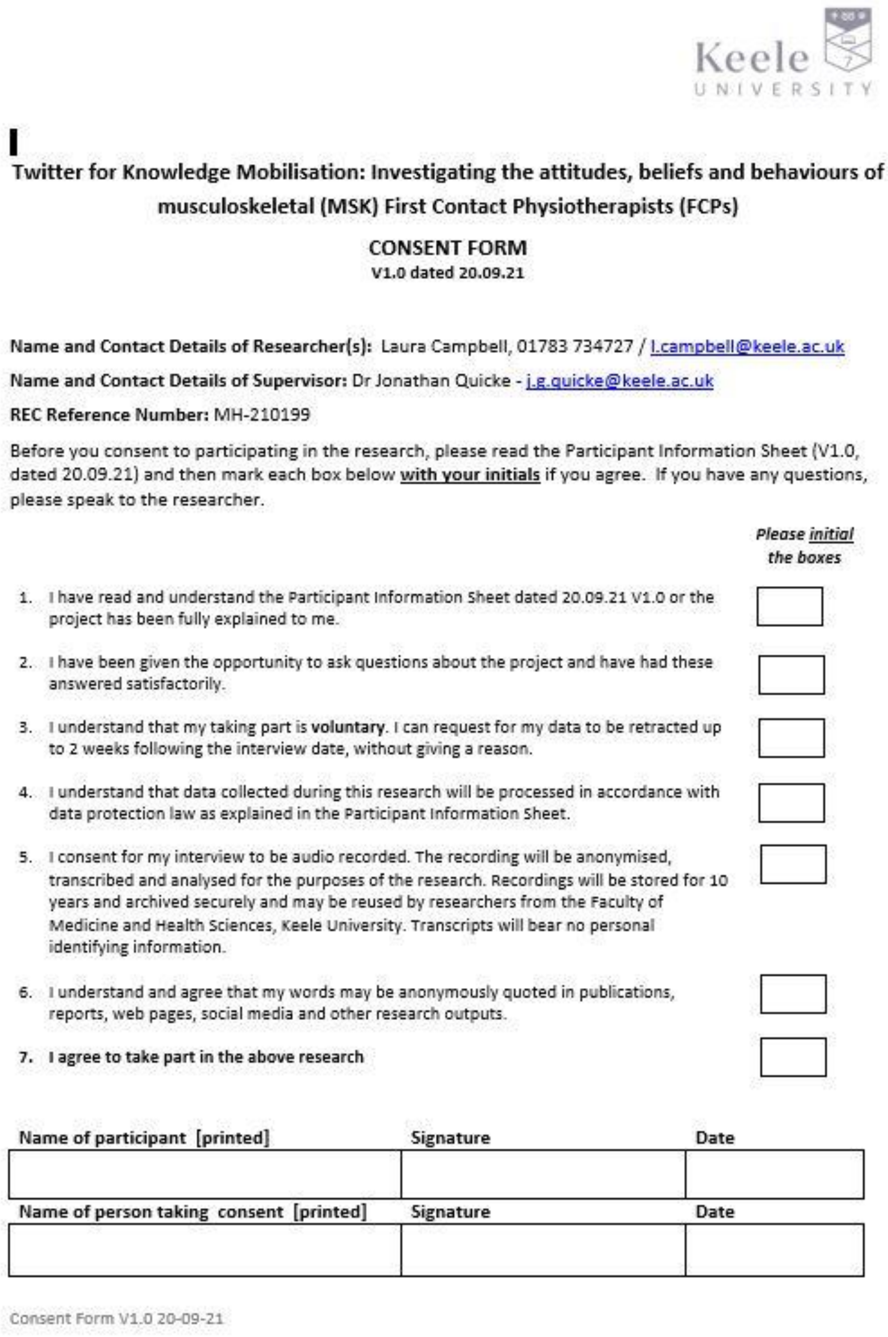
Example 1: (posted 4/11/21)

Researchers @KeeleUniversity are looking for #FCPs who may or may not use Twitter as a source of information for their #clinicalpractice. Interested? Please email l.campbell@keele.ac.uk for more information. #musculoskeletal #msk #physiotherapy #twitter #knowledgemobilisation

Example 2: (posted 5/11/21)

The IAU wants to learn if and how you use Twitter. We'd like to hear from First Contact Physiotherapists! Email l.campbell@keele.ac.uk for info. #musculoskeletal #msk #physiotherapy #twitter #knowledgemobilisation

Appendix 3 – Participant consent form



Keele
UNIVERSITY

Twitter for Knowledge Mobilisation: Investigating the attitudes, beliefs and behaviours of musculoskeletal (MSK) First Contact Physiotherapists (FCPs)

CONSENT FORM
V1.0 dated 20.09.21

Name and Contact Details of Researcher(s): Laura Campbell, 01783 734727 / l.campbell@keele.ac.uk

Name and Contact Details of Supervisor: Dr Jonathan Quicke - j.g.quicke@keele.ac.uk

REC Reference Number: MH-210199

Before you consent to participating in the research, please read the Participant Information Sheet (V1.0, dated 20.09.21) and then mark each box below **with your initials** if you agree. If you have any questions, please speak to the researcher.

Please initial the boxes

1. I have read and understand the Participant Information Sheet dated 20.09.21 V1.0 or the project has been fully explained to me. ☐
2. I have been given the opportunity to ask questions about the project and have had these answered satisfactorily. ☐
3. I understand that my taking part is **voluntary**. I can request for my data to be retracted up to 2 weeks following the interview date, without giving a reason. ☐
4. I understand that data collected during this research will be processed in accordance with data protection law as explained in the Participant Information Sheet. ☐
5. I consent for my interview to be audio recorded. The recording will be anonymised, transcribed and analysed for the purposes of the research. Recordings will be stored for 10 years and archived securely and may be reused by researchers from the Faculty of Medicine and Health Sciences, Keele University. Transcripts will bear no personal identifying information. ☐
6. I understand and agree that my words may be anonymously quoted in publications, reports, web pages, social media and other research outputs. ☐
7. **I agree to take part in the above research** ☐

Name of participant [printed]	**Signature**	**Date**
Name of person taking consent [printed]	**Signature**	**Date**

Consent Form V1.0 20-09-21

Appendix 4 – Participant information sheet

Twitter for Knowledge Mobilisation: Investigating the attitudes, beliefs and behaviours of musculoskeletal (MSK) First Contact Physiotherapists (FCPs)

PARTICIPANT INFORMATION SHEET
V1.0 dated 20.09.21

Name and Contact Details of Researcher(s): Laura Campbell, 01783 734727 / l.campbell@keele.ac.uk

Name and Contact Details of Supervisor: Dr Jonathan Quicke - j.g.quicke@keele.ac.uk

REC Reference Number: MH-210199

Invitation

Thank you for taking time to read this information sheet and for considering volunteering for this research. Joining the study is entirely up to you. Before you decide, please take a minute to understand why the research is being done and what it would involve for you. This should take about 10 minutes. The researcher (LC) will be happy to go through this information sheet with you. If you do agree to participate your consent will be sought; please see the accompanying consent form. You will then be given a copy of this information sheet and your signed consent form, to keep

What is the purpose of this research?

This study will investigate the attitudes, beliefs and behaviours of musculoskeletal (MSK) First Contact Physiotherapists (FCPs) about using Twitter as a source of knowledge to inform clinical practice. This study is important because it aims to uncover the potential of Twitter to support the timely movement of knowledge to, and between, FCPs.

The objectives of the study are:

- *To explore what FCPs think constitutes MSK knowledge*
- *To explore if and how and why MSK FCPs use Twitter to access MSK knowledge to inform their clinical practice, and if not, why not*
- *To investigate what FCPs perceive as strengths, limitations, barriers and enablers of using Twitter to access and utilise musculoskeletal knowledge*
- *To determine what type of Tweet format best communicates evidence to FCPs - which format is most likely to provoke interest to engage and utilise MSK knowledge in practice*

Why have I been invited?

You have been invited to take part in an interview because you have experience in the role of a First Contact Physiotherapist. ***You do not have to use Twitter to take part in this research study,*** *the study will include a mixture of both Twitter users and non-Twitter users.* Your views and experiences of using (or not using) social media to communicate with colleagues and develop your learning for clinical practice are very important and they will help researchers to understand the strengths, limitations, barriers and enablers to using Twitter for knowledge exchange. **Taking part in this study is entirely voluntary.**

If I would like to take part, what do I do?

If you are interested in taking part in the research, please respond directly via email to l.campbell@keele.ac.uk. You will need to read and complete the attached consent form and send it back on the same address via email. **Please indicate in your email whether or not you are a Twitter user.** You will then be contacted by the researcher (LC) to answer any questions you may have and arrange an interview at your convenience. No preparation for the interview is necessary. As a volunteer you can request that your data is retracted up to 2 weeks following the interview date, without giving a reason if you do not wish to. **It is important to note that after this 2-week time point it will not be possible to retract your data or quotations from the study as analysis will have begun, in line with your consent.** The study will be conducted in line with Keele University Data Protection procedures. You can find more information about these procedures and contact information for the university's Data Protection Officer here:www.keele.ac.uk/informationgovernance/checkyourinformationisbeinghandledcorrectly/privacynotice-researchparticipants

What will happen to me if I take part?

You will be asked to take part in 1 interview which will last no more than 60 minutes and will be carried out either by phone or on MS Teams (whichever you prefer) and recorded using a digital voice recorder only (no video, however you will be offered the opportunity to turn your camera off on MS Teams if you wish). There will be no cost to you. Interviews will be carried out in a private, quiet location. Everything you say will be treated with strict confidentiality. You do not have to answer any question that you do not want to.

Will the interview be confidential?

The audio recording will be transferred and stored straight away to the researcher's secure OneDrive, which is university supported, at rest and in transit encrypted and requires two factor identification for access. All transcripts will be pseudoanonymised. Quotations from the discussion may be anonymously quoted in publications, reports, web pages, social media and other research outputs. The recordings and transcripts will be kept for a minimum of 10 years and after this time they will be destroyed. Your contact information (used to organise the interview) will be deleted after the interview has taken place and the two-week withdrawal period has finished. You will be able to request a copy of the study results.

What are the advantages and disadvantages (if any) of taking part?

It is not anticipated that there will be any disadvantages, burdens or risks to you in taking part in this study. Findings of the study may have direct benefit to you and your profession by providing recommendations for you regarding the use of Twitter to access and use best evidence for clinical practice.

Contact information

If you have a query or concern about any aspect of this study, please contact the researcher Laura Campbell – l.campbell@keele.ac.uk / 01782 734727. If there is a complaint, please contact the Lead Supervisor (Dr Jonathan Quicke) with details of the complaint. The contact details for both the researcher and any supervisors are detailed on page 1. If your concern or complaint is not resolved by the researcher or their supervisor, you should contact the approving Research Ethics Committee Chair:

Gary Moss - g.p.j.moss@keele.ac.uk

Appendix 5 – Topic guide 1, Twitter users

Twitter for Knowledge Mobilisation: Investigating the attitudes, beliefs and behaviours of musculoskeletal First Contact Physiotherapists

Research question: What are the attitudes, beliefs and behaviours of MSK FCPs about using Twitter as a source of knowledge to inform clinical practice?

TOPIC GUIDE 1 - TWITTER USERS

Version 3.0 15/02/22

Housekeeping

- Welcome and introductions
- MS Teams housekeeping – microphone and video controls
- Explain the study
- Confirm confidentiality and anonymity
- Go over consent forms – check signature, ask if there are any questions, obtain verbal consent to use a Dictaphone to audio record on MS Teams
- Offer opportunity to switch off video
- Timings of interview – no more than 60 minutes

Aims of the interview

- To explore your views about Twitter and how and why you use Twitter to inform your clinical practice
- To understand what you think are the strengths, limitations, barriers and enablers for Twitter as a way of accessing and using knowledge
- To understand which types of tweet format you find the most engaging and would interact with

REMEMBER: there are no right or wrong answers, this is not a test of your knowledge about twitter or knowledge mobilisation, I want to understand if and how Twitter can be used as a platform for sharing knowledge and experiences

Background questions - current role/practice

1. To start with, can you tell me a bit about your role?

    Prompts

    - *How many years have you been qualified as a physiotherapist and as an FCP?*
    - *Who is your main employer?*
    - *What kinds of patients do you see?*

- *What does your day to day set up look like, for example are you in a GP surgery on your own, or if you have a clinical problem is there someone down the corridor you can talk to?*

2. How are you delivering your care at the moment?

   Prompts

   - *Virtually or face-to-face?*

3. What kinds of information do you tend to use to inform your clinical knowledge and professional development?

Background questions - Twitter

4. I'm going to move on now to talk about Twitter. What do you use Twitter for?

   Prompts

   - *Social, professional, community, networking, just curious*

5. Why Twitter, over other platforms?
6. What is it that you can discover on Twitter than you can't by any other means?
7. What kinds of MSK Knowledge can be accessed on Twitter?

   Prompts

   - *For example, patient cases, clinical cases, evidence alerts, experiences of colleagues, debates and conversations, Tweetchats*
   - *If you access research articles through Twitter, how do you find accessing these on Twitter compared to PubMed, journals etc.*

8. (If working in different teams / split roles) how does that affect your use of Twitter?

Credibility / actors / opinion leaders

9. What types of people do you follow on Twitter?

   Prompts

   - ***Why*** *do you follow them?*

10. Do you have a particular network of FCPs that you follow?
11. How do you identify credible people?

    Prompts

    - *What about identifying credible information?*

Information use

12. Do you feel that you join in with conversations, or post information on Twitter? Or do you tend to take a step back and observe?

    Prompts

    - *Why?*
    - *Do you speak to people you don't know?*
    - *How does this influence your clinical practice?*
    - *Have you used Twitter for networking?*
    - *How does this influence your clinical practice?*

13. There is a lot of information on Twitter. How do you prioritise the information you are looking for?

    Prompts

    - *How do you sort through all that information?*
    - *Is it time consuming? What do you think about having time to appraise information on Twitter as part of your working week?*
14. Have you ever seen clinical conundrums or case studies discussed on Twitter?

    Prompts

    - *Can you tell me a bit more about what happened?*
    - *Did you find this useful?*
    - *Have you ever looked for help to a clinical question on Twitter yourself?*

FCP Twitter use

15. Does anything worry you about using Twitter?

    Prompts

    - *For example, trolling, bullying, harassment, mental health concerns, increased screen time, volume of information, privacy*
    - *Have you ever experienced any of these – can you tell me more about it*?
16. I have spoken to patients as part of this project, one point that came up was the opportunity for them to follow clinicians on Twitter. How would you feel about this?
17. Has sharing knowledge on Twitter changed for you over the last few years?
    - Why / Why not?
    - COVID / New FCP role

Presentation of information

18. Do you think Twitter offers diverse information?

    Prompt

    - *Are you aware of algorithms and what they do? Twitter software uses algorithms to show users the content it thinks they want to see*
19. What are the key ingredients for a Tweet that will make you take notice and either share, like or comment?

    Prompt

    - *For example, images? Animation? Video? Brand? How would this type of Tweet help to develop your clinical decision making?*
    - *Why?*
20. Is there any information you would like to see more of on Twitter?

Wrapping up –

1. *We are coming up to the 60-minute mark now, I’m happy to keep talking for a few more minutes but don’t want to keep you any longer if you have any other commitments?*

2. *Before I close is there anything else about Twitter that we haven't discussed that you would like to mention?*

Closing statement: *Thank you so much for participating in this study and for taking the time to share your views and expertise with me today. Do you have any questions for me today? I would be happy to share the results of the study with you if you are interested I am due to complete my MPhil November 2022. You can keep in contact with me via email l.campbell@keele.ac.uk*

Probing / clarifying / understanding questions to remember

- Why is that the experience for you? (BEHAVIOURS)
- Can you explain a bit more? Can you describe it to me?
- Do you have further examples of this?
- What do you mean by…?
- What did you do? How do you remember it? How did you experience it? (BEHAVIOURS)
- What do you feel about it? What was your emotional reaction to that? (ATTITUDES)
- What do you think about it? (BELIEFS)
- What is your opinion of what happened? How do you judge it today? (ATTITUDES / BELIEFS)

Appendix 6 – Topic guide 2, non-Twitter users

Twitter for Knowledge Mobilisation: Investigating the attitudes, beliefs and behaviours of musculoskeletal First Contact Physiotherapists

Research question: What are the attitudes, beliefs and behaviours of MSK FCPs about using Twitter as a source of knowledge to inform clinical practice?

TOPIC GUIDE 2 – NON-TWITTER USERS

Version 1.0 01/09/21

Housekeeping

- Welcome and introductions
- MS Teams housekeeping – microphone and video controls
- Explain the study
- Confirm confidentiality and anonymity
- Go over consent forms – check signature, ask if there are any questions, obtain verbal consent to use a Dictaphone to audio record on MS Teams
- Offer opportunity to switch off video
- Timings of interview – no more than 60 minutes

Aims of the interview

- To explore your views about Twitter and how and why you use Twitter to inform your clinical practice
- To understand what you think are the strengths, limitations, barriers and enablers for Twitter as a way of accessing and using knowledge
- To understand which types of tweet format you find the most engaging and would interact with

REMEMBER: there are no right or wrong answers, this is not a test of your knowledge about twitter or knowledge mobilisation, I want to understand if and how Twitter can be used as a platform for sharing knowledge and experiences

Background questions - current role/practice

1. To start with, can you tell me a bit about your role?

   Prompts
   - *How many years have you been qualified as a physiotherapist and as an FCP?*
   - *Who is your main employer?*

- *What kinds of patients do you see?*
- *What does your day to day set up look like, for example are you in a GP surgery on your own, or if you have a clinical problem is there someone down the corridor you can talk to?*

2. How are you delivering your care at the moment?

   Prompts

   - *Virtually or face-to-face?*

Background questions - Twitter

3. I'm going to move on now to talk about Twitter. Can you tell me the reasons why you don't use Twitter?

   Prompts

   - *Can you tell me about your experience if you have tried it and stopped using it? Why did you stop?*
   - *Would you consider using Twitter in the future? Why / why not?*

Credibility / actors / opinions leaders

4. Can you tell me a bit about what you think about the people and information on Twitter being credible sources?

Information use

5. Away from social media, what kinds of information do you tend to use to inform your clinical knowledge and professional development?

   Prompts

   - *How do you feel Twitter compares to these?*

6. What do you think about colleagues using information on Twitter to develop their clinical knowledge and professional development?

FCP Twitter use

7. What do you think about Twitter as a place to develop networks and relationships?

Wrapping up –

1. *We are coming up to the 60-minute mark now, I'm happy to keep talking for a few more minutes but don't want to keep you any longer if you have any other commitments?*
2. *Before I close is there anything else you would like to share with me?*

Closing statement: *Thank you so much for participating in this study and for taking the time to share your views and expertise with me today. Do you* *have any questions for me today? I would be happy to share the results of the study with you if you are interested I am due to complete my MPhil November 2022. You can keep in contact with me via email l.campbell@keele.ac.uk*

Appendix 7- Considerations when engaging stakeholders

The following table outlines how practical considerations were taken into account before engaging stakeholders. Adapted from: Practical guidance in engaging stakeholders in health research (Concannon *et al.*, 2019).

Consideration	Achieved by:
Consideration 1 - What is the rationale for engaging stakeholders? • Reasons • How it will improve research • How it will improve care	The main reasons for seeking advice from stakeholders were to optimise the relevance of the research design and eventual delivery of findings into practice. For example, studies in which patient partners co-designed and facilitated research work eventually had more reach and higher engagement levels with the community, than when information was just pushed out by researchers (Elliott *et al.*, 2020)
Consideration 2 - Which stakeholder communities will be engaged? • How to identify stakeholders • Identify decision makers • Identify affected communities • Identify stakeholder preferences for engagement	The study aimed to include individuals to represent as varied a range of perspectives as possible related to Twitter, patients, Knowledge mobilisation KM for clinical practice and First Contact Physiotherapy - the stakeholder communities which could be affected by or interested in the outcomes of this research. It remained a challenge, however, to accurately represent the diversity of entire populations and groups of people through single voices (Concannon *et al.*, 2012). Due to the COVID-19 pandemic, stakeholders were not offered a choice between virtual and face-to-face engagement. They were however offered support and guidance for using the virtual platform MS Teams. Preferences were gathered however on meeting length, time and frequency.
Consideration 3 - How extensively will the stakeholders be engaged? • Preparation • Conducting • Involvement intensity	As is also reiterated by Boaz *et al.* (2018), the necessary resources and rewards for stakeholder engagement were put in place at the organising stage. Patient and public members were reimbursed for their time and provided with the opportunity to speak to the candidate before and after the meeting to clarify any questions. Meetings were scheduled at least six weeks in advance for early evening to accommodate clinical staff, taking place over MS Teams.

- Time and resources needed	Stakeholders were made aware beforehand of why they were invited to the meeting, in order for the discussion to align with study objectives (Deverka *et al.*, 2013) and to create a shared understanding and commitment. Meeting notes were shared with SAG members.
Consideration 4 - What are the appropriate roles and modes by which stakeholders may be engaged? - Stakeholder control - Stakeholders as researchers - Stakeholders proving input - In person or remotely - Group activities - Mixed multi stakeholder	Appropriate stakeholder roles were considered and objectives were clarified. Stakeholders were there to provide remote external input and scrutiny, but not directly conduct the research. Agendas developed to guide the meetings and key areas for discussion and meeting objectives were considered beforehand.
Consideration 5 - What conflict of interest procedures and conflict management resources are needed?	Any conflicts of interest were anticipated and conflict management procedures were put in place. These included clarification of the chair's position to ensure that the interests of one group did not dominate the discussion, by fairly managing the group's interactions and anticipating potential clinician and patient power imbalances.

The following table outlines how best practice recommendations for virtual meetings with stakeholders were taken into account for the SAG meetings. Adapted from: Maximizing virtual meetings and conferences: a review of best practices (Rubinger *et al*, 2020).

Stage	Achieved by:
Pre-plan	Technological accessibility for all stakeholders was assessed prior to the meetings and support offered if needed
Planning	The length and intensity of the meetings was planned according to the need of the stakeholder group. As the group involved patients and was taking place after working hours, care was taken to keep the meetings to two hours with regular comfort breaks. Time for random virtual social networking during the introduction section was taken into account when agenda planning. The recommendation from Rubinger *et al*. (2020) to use synchronous video conferencing with chat and document sharing was followed.
Accomplish	The meeting included a host / chair (the candidate) and moderators / facilitators (the supervisors). Disruption preparedness included back up PowerPoint slides. Discussion was recorded on MS Teams for the candidate's reference with verbal consent from the attendees and the supervisors also made notes throughout.
Response and engage	The candidate and supervisors held a debrief session immediately after the SAG meetings to discuss next steps and reflect on key themes. Transparency of the data gathered and how it will be used to inform the study was important and the candidate kept the stakeholder group updated throughout the study.

Appendix 8 – Stakeholder Advisory Group contributions and agendas

Meeting 1: Date held: 24.06.21

Present:

- Candidate
- Supervisors (n=3)
- Stakeholders (n=9):
    - Patient and public member (Male)
    - Patient and public member (Female)
    - Patient and public member (Female)
    - Senior Media Relations officer, Keele University (Female)
    - Consultant Physiotherapist / Honorary Research Physiotherapist / NICE fellow (Female)
    - Spinal Advanced Physiotherapy Practitioner/ Research Physiotherapist (Female)
    - First Contact Physiotherapy Lead / Consultant physiotherapist / Knowledge Mobilisation Research Fellow (Female)
    - MSK Advanced Physiotherapy Practitioner / First Contact Physiotherapist (Male)
    - Advanced Physiotherapy Practitioner (Female, non-Twitter user)

Agenda:

Time	Agenda item	Chair
5pm – 5.15pm	Welcome and Introductions	Laura Campbell
5.15pm – 5.30pm	Presentation of study overview	Laura Campbell
5.30pm – 6.15pm	Group discussion – thoughts about the study	All
6.15pm – 6.20pm	Comfort break	
6.20pm – 7pm	Patient and Public reflections from the Link Group	Laura Campbell
7pm	Close of meeting	Laura Campbell

Contribution to this study:

Discussion with multiple stakeholders gave new insight into the FCP context and topic of Twitter, and important discussion points were added to the semi-structured interview topic guides to reflect what was most important to stakeholders. Following the first SAG, the candidate debriefed immediately with supervisors who shared any notes taken, then re-watched the MS Teams recording of the meeting and revisited notes taken on the background literature to reflect on these key discussion points, which were then further discussed with supervisors. Once agreed, the candidate then incorporated these key areas into topic guides: Credibility, Professionalism, Negatives of Twitter, Positives of Twitter, Confidence, and Presentation of Knowledge. The SAG highlighted professionalism as important but this had not previously been extensively considered by the candidate. Furthermore, patients raised the point that unlike academic journals and clinical guidelines, Twitter could be perceived as being superficial in nature, and therefore not as trustworthy. The whole group agreed that knowing who to follow and what knowledge to use would be pivotal to the interview guides.

The research aims and objectives were written with FCPs in mind, however the issue of sharing knowledge with patients online emerged from the SAG discussions and was not previously specifically considered by the candidate. The group debated the appropriateness of HCPs sharing their Twitter handle with patients and whether or not Twitter was a good space for patients and HCPs to engage. There was some tension in the group between the patient expectation that Twitter could provide accessibility to HCPs at all times and the HCPs desire to maintain boundaries and ‘downtime’ away from work. This discussion directly informed the inclusion of question 16 in the Twitter User topic guide 1:

I have spoken to patients as part of this project, and one point that came up was the opportunity for them to follow clinicians on Twitter. How would you feel about this?

Meeting 2

Date held: 26.04.22

Present:

- Candidate
- Supervisors (n=2)
- Stakeholders (n=8):
  - Patient and public member (Male)
  - Patient and public member (Female)
  - Patient and public member (Female)
  - Consultant Physiotherapist / Honorary Research Physiotherapist / NICE fellow (Female)
  - Spinal Advanced Physiotherapy Practitioner/ Research Physiotherapist (Female)
  - First Contact Physiotherapy Lead / Consultant physiotherapist / Knowledge Mobilisation Research Fellow(Female)

  - MSK Advanced Physiotherapy Practitioner / First Contact Physiotherapist (Male)
  - Advanced Physiotherapy Practitioner (Female, non-Twitter user)

Agenda:

Time	Agenda item		Chair
5pm – 5.05pm	Welcome		Laura Campbell
5.05pm – 5.30pm	Presentation – study recap, where we are now, introduction to initial themes (Laura Campbell) Presentation - Plain Language Summaries (Link Group member)		Laura Campbell
5.30pm – 6pm	*GROUP DISCUSSIONS:* Sense-checking initial themes in two facilitated break out rooms, allocated on the day		All
	Discussion Group 1 **Facilitated by Jonathan Quicke** Click here to join the meeting	**Discussion Group 2** **Facilitated by Kay Stevenson** Click here to join the meeting	
6pm – 6.05pm	Comfort break (5 minutes)		
6.05pm – 6.30pm	**Discussion Group 1** **Facilitated by Jonathan Quicke** Click here to join the meeting	**Discussion Group 2** **Facilitated by Kay Stevenson** Click here to join the meeting	
6.30pm – 6.45pm	What makes up an ideal tweet?		All
6.45 - 7pm	Next steps		Laura Campbell

Contribution to this study:

The purpose of the second SAG was to discuss six initial themes generated from the data and sense check these with members. At this stage, the six themes were: Knowledge filtering; Knowledge discovery; Interconnected knowledge; Engagement behaviours; Barriers to use; and Credibility. Firstly, the candidate reminded the group of the research question and study objectives and design, before updating them on the progress made so far with interviews, explaining the demographics of participants and how discussions from SAG meeting one informed the interview topic guides. This section of the meeting also included a short presentation from one of the patient and public contributors around Plain Language Summaries and a discussion on how the patient and public contributors could support the candidate in writing their own.

Following breakout room discussions and feedback from the whole group, plus further discussion with supervisors after the meeting, it was decided that the six initial themes were too descriptive and lacked context, resulting in no meaning on their own. The group suggested reflecting on all themes related to knowledge (knowledge filtering, knowledge discovery, interconnected knowledge) and exploring whether or not these would make one theme. These were particularly useful comments from the group and resulted in the creation of final theme two 'Twitter and a journey of knowledge to support clinical practice.' Additionally, the group agreed on the key ingredients for a tweet which were put together from participant comments and highlighted the importance of including a theme which addressed the more negative side of Twitter use.

Appendix 9 – Participant characteristics

Sex m/f	Twitter user y/n	Professional experience	Clinical role and patient caseload	Work environment	Contextual factors
P01					
M	Yes	**Years qualified (physiotherapy):** Ten	**Patient demographics:** 65 years old and above Retired - in an area with a high retirement population	**Employer:** Teaching Hospital NHS Foundation Trust	Has used Twitter for four - five years Has a prior degree in media studies Has taken the MSc FCP module There is a triaging GP available if concerns arise
		Years in FCP role: Two	**Conditions seen:** Mainly long term conditions, complex cases, chronic conditions and degenerative disorders Sometimes acute cases	**Team**: Only FCP working at the GP practice Service currently has four FCPs but all are based at different GP practices in the service	
		General experience: Rotational physiotherapist – 12 months Static MSK physiotherapist / progressing to clinical specialist and team lead before FCP. Injection therapist	**Current role:** Split role - One day a week FCP NHS GP practice Four days a week leads an MSK service - Advanced Physiotherapy Practitioner	**Day to day FCP set up:** 8am - 5.30pm 30-minute appointments Four telephone slots 15 minutes for following up bloods / tests / referrals / reporting back image or blood results 80 – 90 % face-to-face appointments MS Teams used a lot for support structure	

P02					
F	Yes	**Years qualified (physiotherapy):** 16	**Patient demographics:** 18 – 25 years old Mainly university students	**Employer**: Community Healthcare Trust	Comments on Twitter very rarely, identifies as a passive user
		Years in FCP role: Five	**Conditions seen:** Mostly sports injuries	**Team**: One of two FCPs working in the University GP Medical Centre but work at different times The two FCPs at the University GP Practice are part of a city wide MSK service, all Band 7 and 8 MSK physiotherapists Participant has access to senior clinical supervision with Advanced Physiotherapy Practitioner	
		General experience: MSK physiotherapist	**Current role:** Split role – Third of the week FCP NHS University GP Medical Centre Third of the week MSK service - Advanced Physiotherapy Practitioner Third of the week research	**Day to day FCP set up:** 8am start 20-minute appointments Phone appointments during COVID-19, now mostly face-to-face with a few phone calls Service offers same day appointments	

P03					
M	No	**Years qualified (physiotherapy)**: Seven	**Patient demographics:** Even mixture of age groups	**Employer:** Private national FCP provider	Used Twitter previously – stopped because of information overload. Would use again to access research articles quickly Secured current job through LinkedIn Works for a private company which trains FCP supervisors in the NHS and employs approx. 250 FCPs The private provider is contracted by the NHS but participant is personally employed by the private provider 68.5-70% of patients discharged on first appointment. 12 – 13% referred on to physiotherapy, the rest on to x-rays, bloods, GPs for further assessment
		Years in FCP role: One	**Conditions seen:** Chronic MSK conditions but mainly chronic back pain and chronic pain	**Team:** 3.5 FCPs cover five GP practices Works in isolation due to room pressures, moving towards hub approach for increased support Good relationships with the Multi-Disciplinary Team and GPs who have specialities	
		General experience: Extended scope practice for a spinal service, worked for the RAF for three - four years, worked for the NHS for a few years in outpatients and various MSK settings. Independent prescriber and injection therapist	**Current role:** Full time FCP - Lead Split between two GP practices	**Day to day FCP set up:** 8am - 4pm 20 patients a day, assessment, diagnosis and treatment all in one day (injection therapy further appointment) On site face-to-face with some telephone calls	

P04					
M	No	**Years qualified (physiotherapy):** 13.5	**Demographics:** Even mixture of age groups, inner-city area, poor socio-economic backgrounds	**Employer:** NHS Primary Care Network	Occasionally used Twitter for football results
		Years in FCP role: One	**Conditions seen:** Many patients with preventable, lifestyle conditions e.g. obesity Many have associated mental health conditions	**Team:** One of two FCPs working at the GP practice for two days a week, always a GP on site Good relationship with Advanced Nurse Practitioners	
		General experience: Physiotherapist in prisons, Occupational Health, Football, community physiotherapist	**Current role:** Full time FCP Split between two GP practices, four days in one, one day in the other	**Day to day set up:** Tuesdays reserved for triage and phoning patients Thursdays three hours for triage and phoning patients, plus protected learning time Monday, Wednesday, Friday face-to-face appointments	
P05					
F	Yes	**Years qualified (physiotherapy):** 18	**Demographics:** Mixture of patients' socioeconomic status, each practice in diverse areas	**Employer:** NHS Primary Care Network	Started to use Twitter more for networking New service set up by FCPs themselves Holds Communities of Practice meetings for FCPs in their area Portfolio role - two standalone part-time contracts that link together Training lead role supports and facilitates the education and development for all physios working in primary health and social care within the area
		Years in FCP role: Six months	**Conditions seen:** MSK patients - variety of early acute injuries or persistent complex, longstanding pain, fibromyalgia, ongoing joint pain, rheumatology referrals, requests for further testing	**Team:** One of three FCPs in the Primary Care Network, covering three GP Practices each	
		General experience: Secondary care and outpatient physiotherapist	**Current role:** Portfolio role – Two days as an FCP covering three GP practices Two days professional training lead for MSK primary care hub	**Day to day FCP set up:** 20 minute appointments Admin slots Mixture of face-to-face and remote appointments	

P06					
F	Yes	**Years qualified (physiotherapy):** 20	**Demographics:** An even mixture of age groups, some patients with learning difficulties	**Employer:** NHS Hospital Trust	Enterprise clinic – based at one GP practice but speaks to patients from other practices
		Years in FCP role: 18 months	**Conditions seen:** Mixed conditions, mainly foot conditions	**Team:** Only FCP working at the GP practice GP is around but busy Line manager available on the phone	
		General experience: Rheumatology physiotherapy. Advanced clinical practitioner in neurology	**Current role:** Part time FCP Two days a week based at one GP practice Does not work for rest of the week	**Day to day FCP set up:** 8am – 4pm 50/50 video and face-to-face appointments	
P07					
F	Yes	**Years qualified (physiotherapy)** 10	**Demographics:** An even mixture of age groups who often need non MSK holistic care	**Employer:** NHS Primary Care Network	Current merging of services, trying to see where FCP fit in the MSK pathway Support over phone, band 7s have a mentor with them. Enterprise clinic at one of the GP practices – here six different GP practices can book into the FCP clinic
		Years in FCP role: 10 months	**Conditions seen:** A wide range of MSK conditions plus advanced health assessment, healthy lifestyles, wellbeing advice, social prescribing, mental health, smoking cessation, dietary advice, social services	**Team:** Only FCP working at one of the GP practices Other practices participant works alongside a pharmacist / GP	
		General experience: MSK physiotherapist, experience of bloods, images	**Current role:** Full time FCP Covers seven different clinics in seven different places during the week This includes clinics at GP practise and outpatient lists in secondary care	**Day to day FCP set up:** 20 minute appointments Face-to-face appointments Two hours a week blocked out for training, which includes external speakers and is face-to-face at the hospital or over MS Teams	

P08					
M	Yes	**Years qualified (physiotherapy):** 20	**Demographics**: An even mixture of age groups	**Employer:** NHS Primary Care Network	Joined Twitter 10 years ago for CPD reasons
		Years in FCP role: Three months	**Conditions seen:** Mainly MSK, other medical conditions such as chronic kidney disease on top of MSK conditions	**Team:** One of 14 full time equivalent FCPs working across six Primary Care Networks	
		General experience: Previously worked in emergency department - MSK minor injury unit and soft tissue review clinics	**Current role:** Split role - Two days as an FCP in a GP Practice One day Advanced MSK Practitioner in an interface service Two days FCP lead (roadmap supervision - appraising portfolio work or doing clinical supervision)	**Day to day FCP set up:** Not discussed	
P09					
M	Yes	**Years qualified (physiotherapy):** 10	**Demographics:** An even mixture of ages groups and diverse backgrounds. Some housebound patients	**Employer**: NHS University Hospital Foundation Trust	Undertaking masters FCP clinics have patient self-referral Some patients have already seen a GP or someone medical before accessing FCP
		Years in FCP role: One	**Conditions seen:** A mixture of MSK conditions, mainly knee, soft tissue injuries, osteoarthritis flare ups, back pain and non MSK patients for example stroke	**Team:** One of four FCPs at one GP practice but work at different times Only FCP at the other GP practice	
		General experience: Small hospital rotations – orthopaedic, outpatients Orthopaedic interface service. Prescribing	**Current role:** Split role – Two days a week as an FCP in two GP practices Three days a week in hospital outpatients - Advanced Physiotherapy Practitioner	**Day to day FCP set up:** First GP practice - diary runs two weeks in advance. Assess, provide triage, signpost, give exercises. Mixture of face-to-face appointments and e-consults Second GP practice – telephone appointments (which are slightly longer) plus face-to-face appointments	

P10					
M	Yes	**Years qualified (physiotherapy):** 20	**Demographics:** Aged 50 plus	**Employer:** NHS Foundation Trust	Tried to avoid using Twitter but then joined after the Doha consensus, to see anything flagged up as new Learning joint injections therapy
		Years in FCP role: Nine months	**Conditions seen:** Anything MSK - soft tissue, joints or seemingly MSK. Gout, osteoporotic fractures, OA, aches and pains, screening for inflammatory arthritic causes.	**Team:** First GP practice – One of two FCPs working at the GP practice, working at the same place for ½ a day Second GP practice – one of three NHS FCPs on site plus one private FCP, but work at different times	
		General experience: X-rays, bloods, scans	**Current role:** Split role – Three days a week FCP at a GP practice One day a week FCP at a GP practice One day a week advanced MSK practitioner at the local orthopaedic triage service	**Day to day FCP set up:** Mix of face-to-face and telephone	

P11					
F	Yes	**Years qualified (physiotherapy):** Eight	**Demographics:** 16 years old +	**Employer:** NHS Community Healthcare Trust	Has used Twitter for two years, joined after advice from physiotherapist colleague Part of Primary Care Network pilot study, which included five FCPs and four GPs Holds a Master's degree Follows CSP inclusion / exclusion criteria when seeing patients Primary Care Network wants the FCPs to avoid follow up appointments
		Years in FCP role: Two	**Conditions seen:** MSK, occasional post-op, repeated analgesia requests sent for physiotherapist review	**Team:** Only FCP working at the GP surgery One of two full time equivalent FCPs working for the Primary Care Network Individual GP mentor was available to the participant in the pilot study at any time, now just one-hour group mentoring session per week via zoom	
		General experience: Advanced Clinical Practitioner for seven years, Orthopaedic triage service at an acute hospital trust. Injection therapy and prescribing	**Current role:** Split role – One day a week FCP Four days a week hospital - Advanced Physiotherapy Practitioner	**Day to day FCP set up:** Hub based system All face-to-face appointments	
P12					
M	Yes	**Years qualified (Physiotherapy)** Seven	**Demographics:** Mixed ages and economic backgrounds	**Employer**: NHS Foundation Trust	Started using Twitter because of COVID Holds a Master's degree Participant has developed an FCP service with the community mental health team
		Years in FCP role: Three	**Conditions seen:** MSK patients Also sees patients for contraception, chest infection, tonsillitis, mental health conditions, diabetes	**Team:** Leads a team of one FCP, one newly graduated physiotherapist on course to do FCP in two years' time, four clinical assistants.	
		General experience: Quality improvement, data management and risk, online consultations and remote management	**Current role:** Weekly FCP clinics Main role is clinical supervision of a team	**Day to day FCP set up:** 95% virtual consultations, 5% face-to-face	

P13					
F	Yes	**Years qualified (physiotherapy):** Five	**Demographics:** Mixture of ages Both practices have different social demographics One small GP practice and one large GP practice	**Employer**: Social enterprise NHS care provider	Identifies as passive user of Twitter Holds a Master’s degree Band 7
		Years in FCP role: 18 months	**Conditions seen**: First GP practice mostly acute problems Second GP practice mostly persistent pain presentations	**Team**: Only FCP in both GP practices Smaller practice most GPs are working from home Larger practice participant is able to talk to more people	
		General experience: MSK physiotherapist and pain practitioner	**Current role:** Split role – Two days a week as an FCP in two GP practices across two different Primary Care Networks Two days a week working for the pain service, Advanced Physiotherapy Practitioner	**Day to day FCP set up** Compressed hours, seeing 20 – 22 patients a day 90% consultations now face-to-face	
P14					
F	Yes	**Years qualified (physiotherapy):** 22	**Demographics:** Mixture of ages and economic backgrounds	**Employer:** Integrated Health and Care NHS Trust Primary Care Network	New to using Twitter since starting FCP role Identifies as passive user Independent prescriber Working towards injection therapy
		Years in FCP role: One	**Conditions seen:** Majority acute MSK problems and chronic pain. Most often sees neck pain, shoulder pain, knee arthritis, or inflammatory conditions Offers holistic care signposting to community services, trauma and orthopaedic, pain management, psychology	**Team:** The only FCP for the Primary Care Network, covering four different GP practices. No face-to-face communication with other FCPs Can speak to Advanced Nurse Practitioner or GP if needed	
		General experience: General MSK background, with four - five years of experience in chronic pain	**Current role:** Split role – Works four days a week in FCP at four different GP practices	**Day to day FCP set up:** Increased numbers of face-to-face consultations but FCPs are triaging via phone first	

P15					
F	No	**Years qualified (physiotherapy):** 16	**Demographics:** Mixed patients	**Employer:** NHS Foundation Trust	Already has other social media accounts so does not use Twitter
		Years in FCP role: Two	**Conditions seen:** Acute onset MSK conditions, arthritis	**Team:** Split between three GP practices across one Primary Care Network Only FCP in two out of the three GP practices Can speak to GP or send an email if needed	
		General experience: Band 6 community physiotherapist	**Current role:** FCP for two and a half days a week	**Day to day FCP set up:** 75% telephone and 25% face-to-face	
P16					
F	Yes	**Years qualified (physiotherapy):** Not answered	**Demographics:** GP practices are rural Even mix of male and female Slightly older people	**Employer:** NHS Foundation Trust	Mainly retweets FCP provider model FCP taught masters
		Years in FCP role: One	**Conditions seen:** Often osteoarthritis Triaging MSK and non MSK	**Team:** One of two FCPs based in a large GP practice, but only one FCP in at a time Can discuss issues with GP Part of a wider team of five FCPs across Primary Care Network sites Established network of FCPs with fortnightly remote problem patient discussions and six-weekly FCP Continuing Professional Development meetings	
		General experience: Spinal physiotherapy	**Current role:** Part time portfolio role – One day a week in FCP role One day a week as Advanced Practice Spinal Physiotherapist One day a week for Continuing Professional Development and meetings 80% clinical, 20% non-clinical	**Day to day FCP set up:** Patient offered choice face-to-face or virtual appointments	

P17					
M	No	**Years qualified (physiotherapy):** 24	**Demographics:** Mixed ages and social backgrounds	**Employer:** NHS Foundation Trust – Primary Care Network	Has used Twitter to look at information about children's school. Uses Instagram but doesn't post
		Years in FCP role: One	**Conditions seen:** Mostly arthritis Inflammatory, multiple painful sites	**Team**: Only FCP working across two GP practices and three GP groups Can discuss medical issues with GP face-to-face or via message Can discuss physiotherapy (mainly pathways) issues with senior band 8 physiotherapist	
		General experience: Outpatients MSK	**Current role:** Split role – Three days a week in FCP role Two days a week as an outpatient advanced MSK physiotherapist	**Day to day FCP set up:** One GP practice now mostly face-to-face, one GP practice still remote	
P18					
M	Yes	**Years qualified (physiotherapy):** 19	**Demographics:** Pain patients	**Employer:** NHS Foundation Trust	Identifies as a passive Twitter user – not enough time to post
		Years in FCP role: One	**Conditions seen:** Mainly persistent pain, hardly sees acute cases Clinically sees the same patients in consultant role as band 7s	**Team**: Only FCP at one GP practice Can speak to GPs or nurses but doesn't often do that	
		General experience: Part of the FCP pilot FCP type role 10 years ago PhD	**Current role:** Consultant Physiotherapist – in post for one year Oversees MSK physiotherapy services for three large sites and clinical leadership for FCP – 72 sessions per week Does complex pain rehabilitation clinics and FCP clinics and research	**Day to day FCP set up:** Mixed model, moving more towards face-to-face 20 minute appointments	

P19					
M	No	**Years qualified (physiotherapy):** Nine	**Demographics:** Experience of FCP work in affluent (tennis, gardening pains. Simpler cases but expectations on the service higher. Shorter consultation time, less diagnostics ordered) and poorer areas of the city (MSK problems often linked with complex socioeconomic problems. Longer consultation time, more diagnostics ordered)	**Employer:** Social Enterprise NHS Care provider	Joined Twitter nine years ago but rarely uses it More likely to use LinkedIn Primary Care Network hub model - sees patients from across the Primary Care Network but is based in one practice
		Years in FCP role: 2.5 years	**Conditions seen:** Mainly upper limb, shoulder, elbow, hand. Also knees, hips or spines Not much rehabilitation work	**Team:** One of 20 FCPs across the Primary Care Network hub One of four FCPs (two whole time equivalents) Does 75% of one whole time equivalent Two FCPs in the GP practice everyday Can communicate face-to-face or virtually with FCP colleagues	
		General experience: Studying a full Masters	**Current role:** Split role – 75% in FCP role in GP practice 25% in orthopaedic triage role in intermediate care Some private work	**Day to day FCP set up:** Mixed virtual / face-to-face consultations	

Appendix 10 – Examples from reflexive diary

Reflexive diary: P01 (November 2022)

P01 replied that he would be very interested in taking part in the interviews. He found out about the study after I sent the recruitment email to physiotherapy networks in the IAU, and a colleague within that network forwarded it onto her FCP colleagues. P01 replied within 24 hours. He stated that he uses Twitter personally and runs the MSK service Twitter account for his area. The interview took place over MS Teams. I found being in touch over email with the participant and introducing myself was a nice way to break the ice, but I also spent five minutes at the start of the call informally chatting to the participant to help him to feel more at ease. However, he was quite confident from the start and keen to get started. The interview lasted 32 minutes and 22 seconds, which was shorter than I expected. He stated that he had completed a media degree prior to becoming a physiotherapist which I found interesting, and thought it may mean he would be pre-disposed to having an interest / knowledge / confidence in social media. He was very easy to speak to, which helped me to feel less nervous. P01 spoke about using Twitter to get messages out to the service rather than email. I could have probed further for this, for example asking if all of your colleagues are on Twitter to receive these messages/how do you know that is effective/has that been agreed by your team as a good way of sharing information. I will need to probe further on interesting points made by participants in future interviews.

Key reflections from P01:

- Has a support structure but this is virtual rather than face-to-face interaction with colleagues
- Uses Twitter mainly to access research articles for free and sees online databases and journals as 'old fashioned.' Believes that Twitter comments act as a critical appraisal system
- Case studies and clinical scenarios on Twitter are seen as important, stating they have changed his clinical practice
- Does not use Twitter for networking. Believes online conferences do that
- Runs the service's Twitter handle and is more likely to pro-actively post from that than personal Twitter handle
- Has witnessed 'unsavoury' conversations on Twitter, overwhelming amounts of information, concerns for people's mental health

Reflexive diary: P08 (January 2022)

P08 was forwarded the recruitment email from a colleague and told me he had also forwarded to his Trust's FCP cohort. He stated that he uses Twitter.

The interview took place over MS Teams and lasted one hour, one minute and 42 seconds, which was longer than I expected. I found P08 difficult to interview because he went off on tangents and his answers were very long and rambling. On the one hand I wanted to make sure we covered the topic guide questions, on the other hand his comments were very rich and detailed and I didn't want to stop him being able to express himself and his thoughts. I realised though that I had to bring him back to the topic guide questions somehow, and so made notes of several of his points whilst he was talking which were related to the questions, so that I could ask him to go back to these and elaborate. This was a skill I had learned as a journalist, so although I was trying to 'unlearn' the journalistic style of interview and learn the research style, I was relieved that some of my previous training had been useful. On reflection, I think he may have been nervous at the start of the interview, as the conversation started to flow better towards the end and his comments were more logical. I will make sure to note this in future interviews and if participants seem nervous, try to address this earlier on. I will also try harder to get all questions asked. I liked his description of Twitter offering 'low hanging knowledge fruit.'

Key reflections from P08:

- Similar to previous participants, P08 identified himself as a lurker
- Similar to previous participants, P08 talked about Twitter opening up knowledge sharing in the NHS
- Similar to previous participants, P08 talked about peer pressure and how trying to keep up with 'all' the relevant information on Twitter is overwhelming
- Unlike previous participants, P08 spoke about how the deterioration of mental health in general society is reflected on Twitter, which is an interesting point

Appendix 11 – Positionality statement

I have worked as a newspaper journalist for eight years and magazine editor for four years, having previously been employed as a translator after completing a BA (Hons) in French, German and European Studies from the University of Bath. In 2016, I started a new career at Keele University's School of Medicine as a User Support Worker in the PPIE team for research and implementation, which involved supporting members of the public to share their experiences of living with health conditions with researchers, in order to keep research relevant and patient focussed. Taking this role was inspired by a combination of my communications background, my own personal patient journey and my experience in patient advocacy as a volunteer Senior Representative for the Scoliosis Association UK.

I became a Knowledge Broker for the IAU in 2020 after leading the Link Group for several years, developing communications strategies for effective KM in the IAU, and working with the unit's stakeholders to co-create evidence-based patient information. At the same time, I was volunteering with the hospital clinical team to transform clinical pathways for Children's Spinal Surgery and co-developing their patient information. My academic interest in KM research and practice developed from my experience of working with healthcare professionals, academics, patients and the public to mobilise knowledge into practice and becoming aware of the important role that relevant, novel and creative methods can play in evidence implementation and the subsequent impact on patient care.

I was then offered the opportunity to complete a KM MPhil as part of my role as a Knowledge Broker in order to better understand the academic stakeholder perspective and to equip me with research skills for further KM work within the unit. The rigorous academic training would provide me with the understanding needed to further develop my passion for the topic of social media and communication methods for KM, to know how to creatively but credibly adapt research knowledge for practical use for HCPs via Twitter.

I maintained brief research journal notes from the start of the MPhil to try to better understand my own position as a researcher within this study. During interviews I made notes of my thoughts, feelings and interactions and considered how my previous and current roles and experiences were reflected in how I conducted myself during interviews and how I interacted with the data during analysis. Ongoing, reflective discussions with the immediate research team and reading also helped me to become more aware of how my own experiences can influence my research. I have highlighted my main learning points below.

Firstly, having an influence as a researcher differs greatly from influencing interactions in journalism. Although un-biased, balanced articles were the goal of responsible reporting, when carrying out background research and interviewing sources as a journalist it was necessary to keep in mind the underlying purpose of the article and its intended readership, therefore articles would always take on a certain ‘slant.’ Interviews sometimes contained closed, leading questions, rather than being open and neutral. With this in mind, I wanted to acknowledge my own innate experiences and perspectives from the start of the research process and be reflexive to these throughout, especially during the interview stage. I believe that like journalists, exploratory researchers cannot be completely value free and completely separate their personal perspectives, unconscious biases and past experiences. Due to the nature of my research methods, the decisions I made and perspectives I had will have affected my role in data collection and analysis and therefore bias could never have been completely eliminated and in research, respective social and professional roles always shape the interview process. However, I strived to ensure my research outputs were as unbiased, honest and transparent as possible by being aware of, and mitigating where possible, my own bias and experiences as I progressed. Furthermore, having extensive experience in communicating and interviewing a diverse range of people enabled me to encourage a relaxed and easy rapport with participants, thereby yielding rich data. I did not disclose my former employment to participants.

A further reflection point for me was in regards to social media and confidence. My social media journey has been a positive one, having learned quickly and naturally thanks to my communications background and employment as a Knowledge Broker. In this study, I became aware and sometimes frustrated that this may not be the case for others.

As I was not a part of the culture of participants being studied (FCPs) I counted myself as an outsider (Bourke, 2014). It was important therefore to be aware of my own knowledge gaps and lack of confidence not only as a non-FCP but as a student researcher. I am not a clinician, I do not know how to treat patients and I will never fully understand the demands and pressures of working in professional clinical MSK settings. Furthermore, I have been a MSK patient myself for many years and been treated by physiotherapists, I have also worked closely with people with MSK conditions during my career and voluntary work and so I tended to have more understanding of patient issues from ‘the other side of the coin.’ Awareness of this made me proactively try to further my understanding of the First Contact Physiotherapist’s context by talking to colleagues at Keele who have knowledge and experience of the role and its demands. Despite having planned a research protocol prior to conducting the interviews, I stayed flexible to follow lines of interest and insight as the study progressed.

My role as Knowledge Broker in the School of Medicine’s IAU was briefly described to participants to set the context in which the research is being carried out and its purpose in KM. I had not directly met any of the participants previously, however some were aware of the work of the unit and the work of colleagues, which may have encouraged them to take part in the interview and may have influenced how they responded to questions – perhaps answering positively if they knew of me or of colleagues in the IAU. Furthermore, working within a nationally recognised Versus Arthritis Research Centre of Excellence may have influenced participants to take part in order to satisfy their engagement with the ‘research pillar’ portion of the FCP roadmap. Previous experience and knowledge of clinical, academic and public cultures and perspectives gained in my role were acknowledged throughout the data collection and analysis stages. Whilst I acknowledged to myself any biases and experiences I had during the study, I also embraced subjectivity to tell a true story of the data which was co-produced between myself and the participants, in particular findings around the issue of patients following HCPs on Twitter, which was a question that had not previously been considered by participants until they spoke to me about it. This led to an interesting process of socially co-constructing a narrative between myself and the participant rather than data being objectively determined, reflecting the underpinning philosophical research assumption that there are multiple beliefs, realities and viewpoints to be co-created through the interview method.

Previous experience as a journalist made the analysis stage challenging. I found it difficult to move away from descriptive ‘headlines’ as theme names and my supervisors helped me to challenge this and become more neutral and nuanced. I was also aware that my positionality influenced what interested me in the data, as a communicator, social media user and patient advocate and I took care to constantly return to the research question.

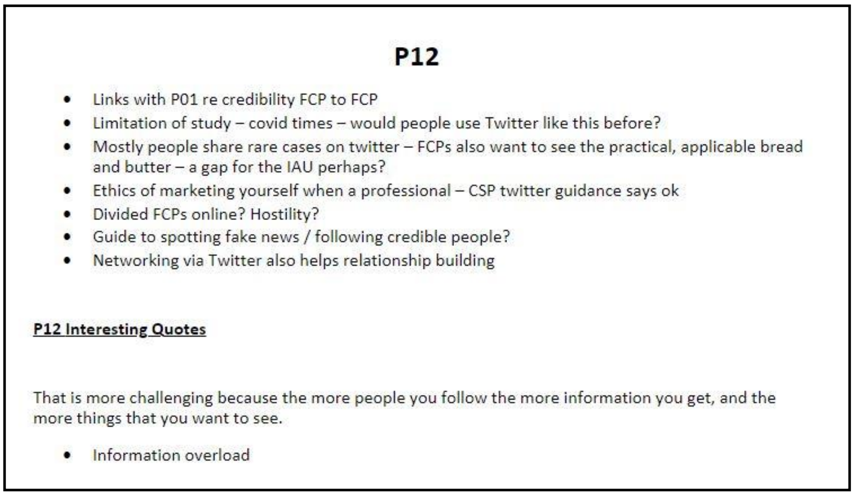
Finally, as a Knowledge Broker I work in a rapid, process driven and creative environment at the KM or ‘pushing out’ part of the research cycle. It quickly became apparent to me that it would be a personal challenge to be in the more considered, slower research phase of the research cycle but once I acknowledged this early on it was easier to embrace the journey.

The MPhil has changed me and my role. It has given me deeper insight into research, helped me to consider information more analytically, critically and contextually, and supported me to grow more confident in my understanding of KM.

Appendix 12 – Examples of analysis

Appendix 12 a – Extract from memos

Initial observations and insights were noted in the form of memos, and potential extracts of interest from the data (quotes) were highlighted for future reference:



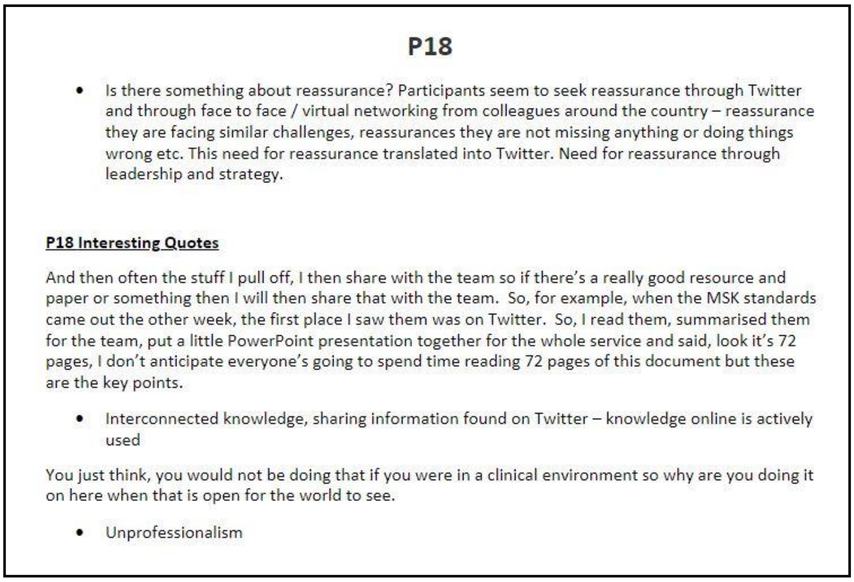
P12

- Links with P01 re credibility FCP to FCP
- Limitation of study – covid times – would people use Twitter like this before?
- Mostly people share rare cases on twitter – FCPs also want to see the practical, applicable bread and butter – a gap for the IAU perhaps?
- Ethics of marketing yourself when a professional – CSP twitter guidance says ok
- Divided FCPs online? Hostility?
- Guide to spotting fake news / following credible people?
- Networking via Twitter also helps relationship building

P12 Interesting Quotes

That is more challenging because the more people you follow the more information you get, and the more things that you want to see.

- Information overload



P18

- Is there something about reassurance? Participants seem to seek reassurance through Twitter and through face to face / virtual networking from colleagues around the country – reassurance they are facing similar challenges, reassurances they are not missing anything or doing things wrong etc. This need for reassurance translated into Twitter. Need for reassurance through leadership and strategy.

P18 Interesting Quotes

And then often the stuff I pull off, I then share with the team so if there's a really good resource and paper or something then I will then share that with the team. So, for example, when the MSK standards came out the other week, the first place I saw them was on Twitter. So, I read them, summarised them for the team, put a little PowerPoint presentation together for the whole service and said, look it's 72 pages, I don't anticipate everyone's going to spend time reading 72 pages of this document but these are the key points.

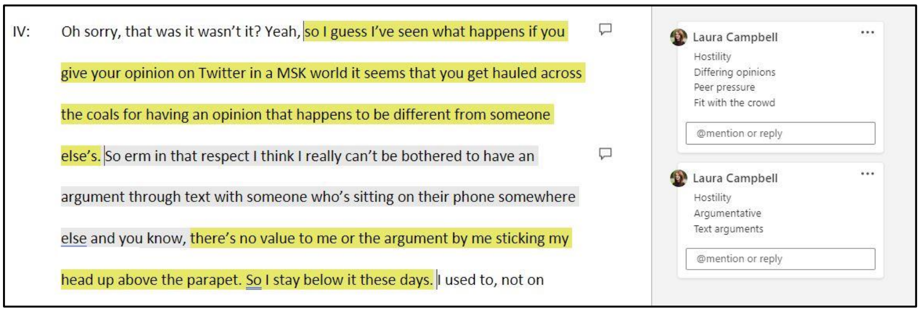
- Interconnected knowledge, sharing information found on Twitter – knowledge online is actively used

You just think, you would not be doing that if you were in a clinical environment so why are you doing it on here when that is open for the world to see.

- Unprofessionalism

Appendix 12 b – Screenshot of coding

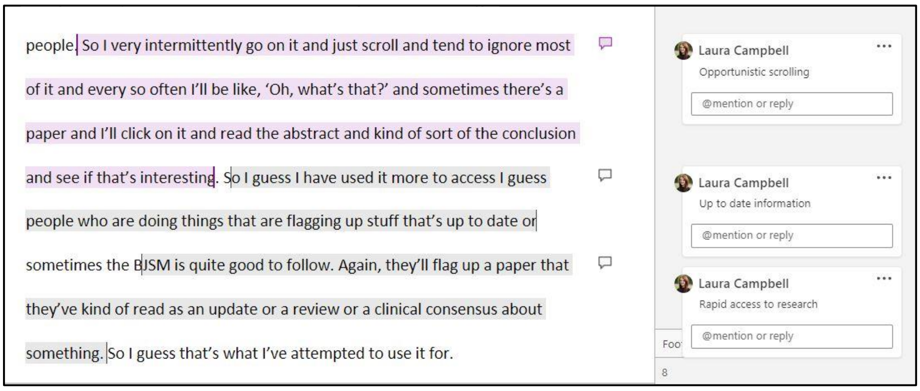
Codes were systematically generated across the dataset. The candidate coded the data in the transcripts using the comments box function in Word:



IV: Oh sorry, that was it wasn't it? Yeah, so I guess I've seen what happens if you give your opinion on Twitter in a MSK world it seems that you get hauled across the coals for having an opinion that happens to be different from someone else's. So erm in that respect I think I really can't be bothered to have an argument through text with someone who's sitting on their phone somewhere else and you know, there's no value to me or the argument by me sticking my head up above the parapet. So I stay below it these days. I used to, not on

Laura Campbell
Hostility
Differing opinions
Peer pressure
Fit with the crowd

Laura Campbell
Hostility
Argumentative
Text arguments



people. So I very intermittently go on it and just scroll and tend to ignore most of it and every so often I'll be like, 'Oh, what's that?' and sometimes there's a paper and I'll click on it and read the abstract and kind of sort of the conclusion and see if that's interesting. So I guess I have used it more to access I guess people who are doing things that are flagging up stuff that's up to date or sometimes the BJSM is quite good to follow. Again, they'll flag up a paper that they've kind of read as an update or a review or a clinical consensus about something. So I guess that's what I've attempted to use it for.

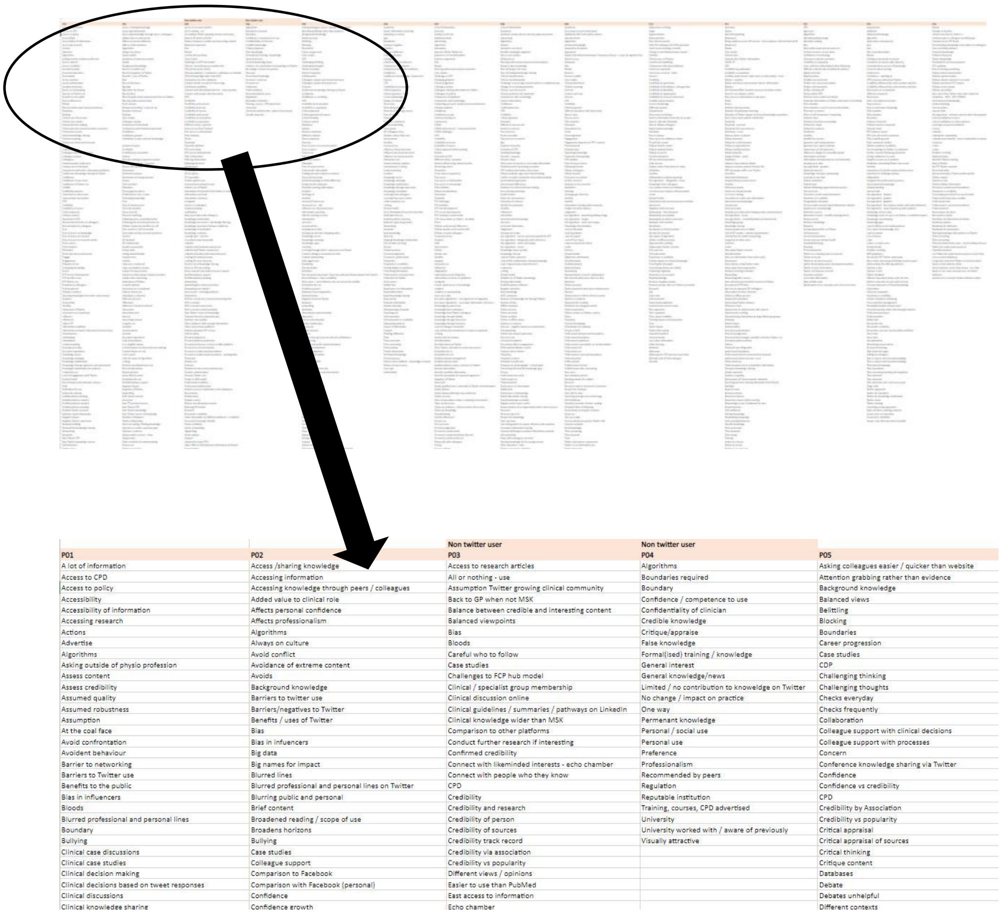
Laura Campbell
Opportunistic scrolling

Laura Campbell
Up to date information

Laura Campbell
Rapid access to research

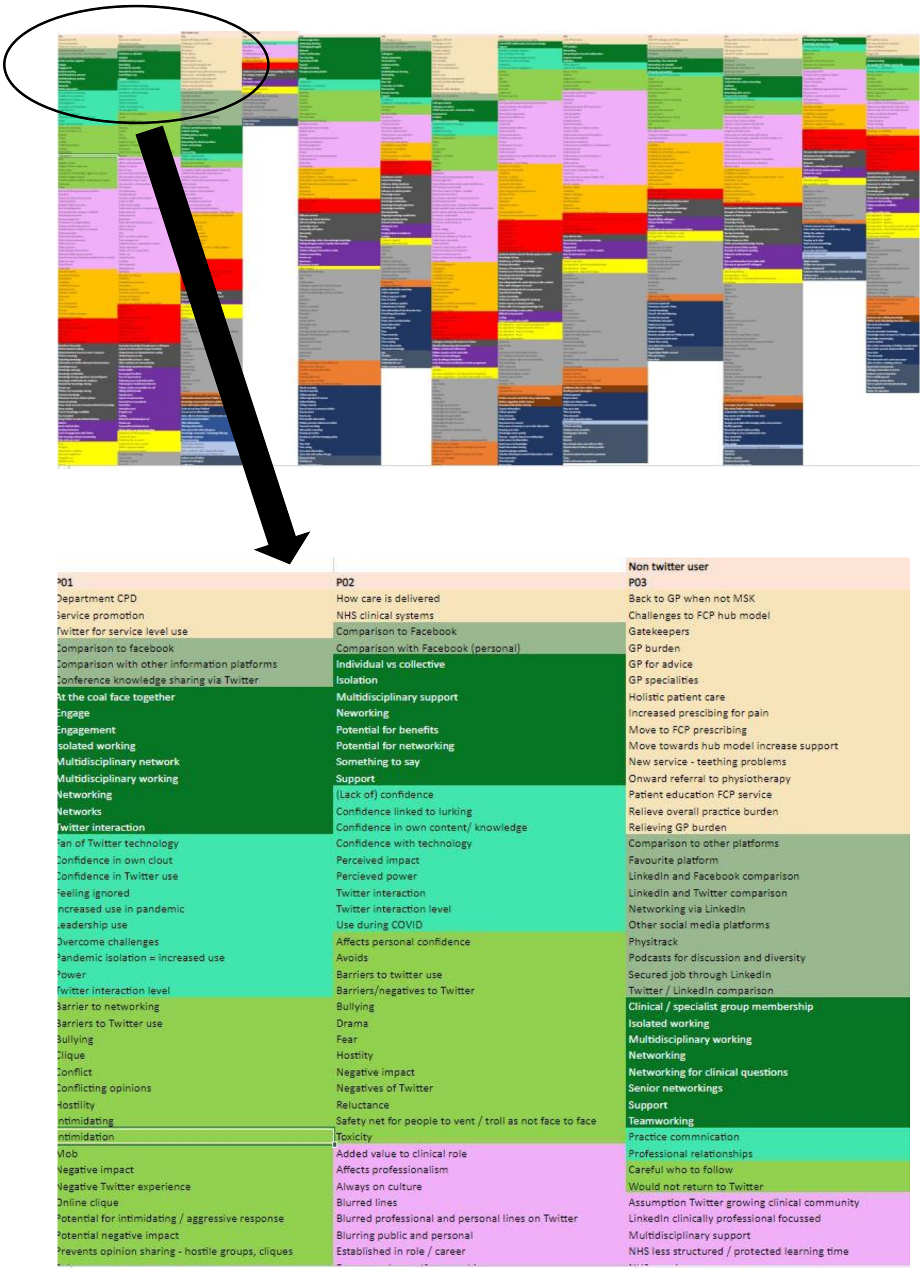
Appendix 12 c – Screenshots of initial code spreadsheets

All initial codes from the 19 transcripts were copied from the Word documents into an Excel spreadsheet, with each column representing a participant. Duplicate codes within each participant column were deleted (but not across the dataset) leaving 1863 initial codes in total:



		Non twitter user	Non twitter user	
P01	**P02**	**P03**	**P04**	**P05**
A lot of information	Access /sharing knowledge	Access to research articles	Algorithms	Asking colleagues easier / quicker than website
Access to CPD	Accessing information	All or nothing - use	Boundaries required	Attention grabbing rather than evidence
Access to policy	Accessing knowledge through peers / colleagues	Assumption Twitter growing clinical community	Boundary	Background knowledge
Accessibility	Added value to clinical role	Back to GP when not MSK	Confidence / competence to use	Balanced views
Accessibility of information	Affects personal confidence	Balance between credible and interesting content	Confidentiality of clinician	Belittling
Accessing research	Affects professionalism	Balanced viewpoints	Credible knowledge	Blocking
Actions	Algorithms	Bias	Critique/appraise	Boundaries
Advertise	Always on culture	Bloods	False knowledge	Career progression
Algorithms	Avoid conflict	Careful who to follow	Formal(ised) training / knowledge	Case studies
Asking outside of physio profession	Avoidance of extreme content	Case studies	General interest	CDP
Assess content	Avoids	Challenges to FCP hub model	General knowledge/news	Challenging thinking
Assess credibility	Background knowledge	Clinical / specialist group membership	Limited / no contribution to knoweldge on Twitter	Challenging thoughts
Assumed quality	Barriers to twitter use	Clinical discussion online	No change / impact on practice	Checks everyday
Assumed robustness	Barriers/negatives to Twitter	Clinical guidelines / summaries / pathways on LinkedIn	One way	Checks frequently
Assumption	Benefits / uses of Twitter	Clinical knowledge wider than MSK	Permenant knowledge	Collaboration
At the coal face	Bias	Comparison to other platforms	Personal / social use	Colleague support with clinical decisions
Avoid confrontation	Bias in infuencers	Conduct further research if interesting	Personal use	Colleague support with processes
Avoident behaviour	Big data	Confirmed credibility	Preference	Concern
Barrier to networking	Big names for impact	Connect with likeminded interests - echo chamber	Professionalism	Conference knowledge sharing via Twitter
Barriers to Twitter use	Blurred lines	Connect with people who they know	Recommended by peers	Confidence
Benefits to the public	Blurred professional and personal lines on Twitter	CPD	Regulation	Confidence vs credibility
Bias in influencers	Blurring public and personal	Credibility	Reputable institution	CPD
Bloods	Brief content	Credibility and research	Training, courses, CPD advertised	Credibility by Association
Blurred professional and personal lines	Broadened reading / scope of use	Credibility of person	University	Credibility vs popularity
Boundary	Broadens horizons	Credibility of sources	University worked with / aware of previously	Critical appraisal
Bullying	Bullying	Credibility track record	Visually attractive	Critical appraisal of sources
Clinical case discussions	Case studies	Credibility via association		Critical thinking
Clinical case studies	Colleague support	Credibility vs popularity		Critique content
Clinical decision making	Comparison to Facebook	Different views / opinions		Databases
Clinical decisions based on tweet responses	Comparison with Facebook (personal)	Easier to use than PubMed		Debate
Clinical discussions	Confidence	East access to information		Debates unhelpful
Clinical knowledge sharing	Confidence growth	Echo chamber		Different contexts

Duplicate and similar codes were then deleted or combined, leaving 578 initial codes. Initial patterns of meaning were then identified and clustered together into central organising concepts. Codes were grouped together using colour coding into initial themes:



		Non twitter user
P01	P02	P03
Department CPD	How care is delivered	Back to GP when not MSK
Service promotion	NHS clinical systems	Challenges to FCP hub model
Twitter for service level use	Comparison to Facebook	Gatekeepers
Comparison to facebook	Comparison with Facebook (personal)	GP burden
Comparison with other information platforms	Individual vs collective	GP for advice
Conference knowledge sharing via Twitter	Isolation	GP specialities
At the coal face together	Multidisciplinary support	Holistic patient care
Engage	Neworking	Increased prescibing for pain
Engagement	Potential for benefits	Move to FCP prescribing
solated working	Potential for networking	Move towards hub model increase support
Multidisciplinary network	Something to say	New service - teething problems
Multidisciplinary working	Support	Onward referral to physiotherapy
Networking	(Lack of) confidence	Patient education FCP service
Networks	Confidence linked to lurking	Relieve overall practice burden
Twitter interaction	Confidence in own content/ knowledge	Relieving GP burden
Fan of Twitter technology	Confidence with technology	Comparison to other platforms
Confidence in own clout	Perceived impact	Favourite platform
Confidence in Twitter use	Percieved power	LinkedIn and Facebook comparison
Feeling ignored	Twitter interaction	LinkedIn and Twitter comparison
ncreased use in pandemic	Twitter interaction level	Networking via LinkedIn
Leadership use	Use during COVID	Other social media platforms
Overcome challenges	Affects personal confidence	Physitrack
Pandemic isolation = increased use	Avoids	Podcasts for discussion and diversity
Power	Barriers to twitter use	Secured job through LinkedIn
Twitter interaction level	Barriers/negatives to Twitter	Twitter / LinkedIn comparison
Barrier to networking	Bullying	Clinical / specialist group membership
Barriers to Twitter use	Drama	Isolated working
Bullying	Fear	Multidisciplinary working
Clique	Hostiity	Networking
Conflict	Negative impact	Networking for clinical questions
Conflicting opinions	Negatives of Twitter	Senior networkings
Hostility	Reluctance	Support
ntimidating	Safety net for people to vent / troll as not face to face	Teamworking
ntimidation	Toxicity	Practice commnication
Mob	Added value to clinical role	Professional relationships
Negative impact	Affects professionalism	Careful who to follow
Negative Twitter experience	Always on culture	Would not return to Twitter
Online clique	Blurred lines	Assumption Twitter growing clinical community
Potential for intimidating / aggressive response	Blurred professional and personal lines on Twitter	LinkedIn clinically professional focussed
Potential negative impact	Blurring public and personal	Multidisciplinary support
Prevents opinion sharing - hostile groups, cliques	Established in role / career	NHS less structured / protected learning time

Appendix 12 d – Table of initial themes 1

Initial themes (n=19)	Theme synopsis	Codes (n=578)
Information filtering behaviour online	Participants filter people and information on Twitter, through 1) Searching / prioritising trusted sources 2) Evaluating the content, source, context and relevance 3) Critically appraising	N=22 Active, specific information searching; Removes / follows people based on personal information standards; Need to check Twitter feed frequently to not miss anything; Evaluating knowledge, sources, context; Consensus approaches to information online; Critical appraisal of online knowledge, people, sources and tweets; Cross reference information before following; Appraisal of followers / who to follow; Non-appraisal of followers / who to follow; Finding relevant evidence; Filtering information; Further knowledge hunting; No prioritisation; No time for journals; Prioritising information from trusted sources (NHS Trusts, national bodies, universities, publications) ; Researchers present study benefits and flaws; Researches tweets before posting; Retweeting to save / bookmark for later; Seek out different opinions; Selective following to combat information overload; Snowball following; Specifically search databases but not Twitter; Summarised research easier
Reasons for filtering information online	This could be because of 1) Time demands and the need for speed 2) Keeping up to date with the most relevant policy and research knowledge 3) Ease of accessing pre-appraised / filtered information	N = 32 Accessibility (research, policy, CPD); Assess credibility; Central resources in one place; Concise, bite-sized information; Critical appraisal needed for patient safety; Ease of access to knowledge; Easier doesn't equal best; Easier to use than PubMed; Easy to remember knowledge; Easy to use; False sense of security re up to date information; Information at your fingertips; Instant, rapid, updates on quickly changing current knowledge; Knowledge easier to access on Twitter vs published papers; Not as time consuming as finding research paper; Overuse - negative impact on relationships; Positive patient interaction on Twitter; Pre-appraised; Rapid information sharing; Relevant, pre-appraised content; Service updates on twitter valuable; Speed of information; Stay up to date; Takes effort to find balanced information on Twitter; Time consuming; Time saving; Translated knowledge; Tweet

		evaluation (at the level of tweet); Value of others collating evidence; Would access research if tweet linked to article
Filtering behaviour offline	Similar prioritisation of information online and offline	N = 10 Access to research articles; Busy life, needs quick access to clear, concise, credible, relevant information; Critical appraisal of information; Prioritises information from trusted sources (NHS Trusts, national bodies, universities, publications); Time consuming; Keep up to date with colleagues; Knowledge movement = knowledge filtering; Need for knowledge summaries; Prioritises pre-researched, pre-collated information; Prefers paper journals than screens
Amount of information	Too much information can paralyse knowledge use and knowledge sharing	N=13 A lot of information; Additional work; Doesn't actively engage because of information overload; Following threads; Hard to keep track of information sources; Information overload; Information overload and loss of productivity; Information summaries needed; Other platforms offer enough information; Overwhelming; Overwhelming information on large WhatsApp groups; Too many information sources; Too much information stops Twitter use
Knowledge Discovery	Information that can't be found elsewhere, a lucky dip of information, clicking on a link / tweet and being taken on a knowledge journey to another link / article / person to follow. New knowledge type?	N=34 Access to current discussions; Broadens horizons; Clinical knowledge wider than MSK; Different views / opinions; Ease of access; Expansion of knowledge; FCP Twitter use; Generation of new research questions; Global knowledge to think differently; Going into the unknown; Good for evolving information; Having an open mind to information; Information aid - Twitter; Inspiration to create own information; Interesting content; Knowledge discovery offline through conversation; Less control of knowledge seen; Loss of choice; Mindless scrolling; Mix of known and unknown contacts; Open conversations online vs working environment; Open to reading / finding knowledge; Openness to others and new ways; Opens up evidence / clinical practice discussions; Opportunistic scrolling; Pick up links on Twitter vs formal training; Prefers face-to-face CPD than scrolling; Rabbit hole; Seeing opportunities on Twitter; Snowball effect following people and information; Stressful scrolling;

		Thinking differently; Twitter as a starting point for finding information; Twitter opens up hidden knowledge; Variety of knowledge available
Interconnected knowledge	How knowledge is connected, how / if it is used on other platforms or in real life	N=28 Additional info from article authors; Building on knowledge foundations; Clinical knowledge sharing; Disseminating knowledge from twitter to colleagues; Feedback to colleagues; Further research needed for deep understanding; Gleaning knowledge from other professionals; information crossover on platforms; Information movement from Twitter to LinkedIn; Interconnected knowledge; Knowledge movement between platforms; Knowledge sharing offline; May adapt Twitter content; Motive for sharing; Onward knowledge sharing; Onwards dissemination for colleagues from email; Reading around the subject; Same information on different platforms = credibility; Secondary information sharing; Signposting to further expertise; Someone else collating knowledge; Summarising knowledge for others; Twitter discussions signpost to further resources; Twitter posts stimulating team discussion; Twitter signposts to further resources; Twitter suggesting similar content; Uses paper shared on Twitter for clinical changes; Webinars encourage further reading
Knowledge types	Sources and examples of empirical, theoretical, experiential, explicit and tacit knowledge	N=74 Academia / universities; Advertising / marketing of meetings, courses, events, jobs, recruitment; Asking questions; Background / general knowledge; Broad vs deep knowledge; Bread and butter cases; Businesses; Career progression; Case studies; Charity information; Clinical knowledge; Clinical placements; Collaboration - internal and external; Colleague support with clinical decisions, processes; Complimentary Sources of Knowledge; Communication outside of physio profession; Conference knowledge sharing via Twitter; Day to day knowledge; Databases; Debate and discussion - useful, unhelpful; Discussion with multidisciplinary team; Editorials; Electronic resources; Email; Events; Evidence-based care; Evidence summaries; External speakers; FCP further knowledge - X-rays, imaging, further tests, medications, red flags, serious pathology; FCP roadmap discussions; Formal(ised) training / knowledge - masters, CPD, training, education, courses; Free knowledge on twitter; Graphics; Guidelines; Heuristics; Health inequalities; Hierarchy of evidence; Hospital library

		journal search; In house resources; Infographics; Journal articles; Journal club; Knowledge within self; Librarian / library services; Literature; MS Teams; National / Governing bodies; Newsletters; Observing others' experiences on Twitter; Online learning - podcasts, webinars, videos; Online relationships, networking, communities; Opinions ; Other social media - WhatsApp, LinkedIn, YouTube, Facebook, Instagram; Pathways; Patient experiences; Patient information; Peer to peer support / mentoring / training, online and offline; Personal appraisal; Policies; Practical knowledge; Presentations to update knowledge; Professional links; Public Health messages; Rare cases; Research involvement; Research journals; Second opinions; Service development; Signposting; Specific / special interest knowledge; Take home messages; Teaching; Team information resources; Use knowledge for beyond the role; Value of experiential over explicit knowledge
Key tweet ingredients	What are the key things that would make someone like, comment, retweet, engage with content in a Tweet	N=20 Attention grabbing; Balanced and non-extreme content; Cartoons - negative; Content and style; Credible content - backed up with references; Credible poster - who has shared it and why have they shared it; Easy to access; Full access; Key, bit sized evidence points; Mixture of personal and professional information; More than just links; No sound; Pragmatic use - can be used and adapted by FCPs, relevant to practice; Recommended by peers / Something liked and shared a lot; Reflects own personality; Short and snappy; Simple visuals easier to remember; Up to date information; Use of emoji to attract attention; Visual preference - graphics, images, infographics preference
Knowledge mobilisation and use offline	Examples and thoughts around the mobilisation of knowledge away from Twitter	N=17 Academic debate doesn't directly apply to practice; Accessing knowledge through peers / colleagues; Active networks for knowledge sharing; Importance of real life contextual discussions; Information dissemination to practice via email; Journal clubs; Knowledge sharing organisers and participants; Knowledge through experience; Knowledge through professional membership; Live discussion; Impacts clinical practice; National / local context comparison; Online journals rather than paper; Onward knowledge sharing offline - email, training; Other methods of communicating; Prioritising info

		that fills knowledge gaps; Staff / team meetings important for knowledge; Training impacts clinical practice
Knowledge mobilisation Knowledge mobilisation and use on Twitter	Examples and thoughts around the mobilisation of knowledge on Twitter	N=37 Access to new, current knowledge; Case studies; Challenging opinion; Colleagues sharing information on Twitter; Community of Practice online; Complimentary source of knowledge; Detrimental offline incidents because of actions online; Evaluating knowledge; Experiences; FCP policy, news development, roadmap; Influencing / not influencing clinical practice, reasoning, judgement; Informs training sessions; Knowledge contexts - adapting, differing, audiences; Knowledge dilution on social media; Knowledge mobilisation; Knowledge pressure with constant rapid information updates; Low hanging knowledge fruit on Twitter; Mindful use of Twitter knowledge; Missing knowledge; Mnemonics; Move away from PowerPoints; National / local context comparison; New terminology; Nuances of knowledge lost through Twitter - superficial knowledge; One way / two way knowledge exchanges; Onward knowledge sharing online - retweeting, other platforms; Practical use of twitter knowledge = clinical gold; Prioritising info that fills knowledge gaps; Reluctance to post - hostility and arguments; Respect for knowledge; Save information for later use; Senior knowledge; Sense making, knowledge relevance; Sharing knowledge for the wrong reasons; Tweet impact; Varying amounts of Twitter knowledge contribution by FCPs; Well informed patients on Twitter
Engagement behaviours	Most FCPs are ‘lurkers’, - lack confidence to share knowledge - unprofessionalism, hostility, intimidation, conflict, mental health	N=40 Addiction; All or nothing use; Asking colleagues easier / quicker than website; Avoidant behaviour - conflict, confrontation, attention, reactions, hostility, nothing to offer, confidence; Direct messages - privacy, personal, individual, networking, learning, more characters; Distinguish between professional and non-professional account to avoid confusion; Doesn't follow colleagues; Encouraged by others; Engagement depends on FCP's context; Enjoy watching arguments; Fear of missing out; Fear of professional repercussions; Follow the crowd; Following more COVID information; Hiding behind handle; Increased use in pandemic; Irregular use; Lack of time and commitment to evidence Tweet; Limited colleague interaction in clinic; Lurker; Methodical and reasoned person to follow; More likely

		to follow someone popular; Not easy to approach GP colleagues; Personal use; Posting; Posting as part of the job; Professional use; Reasons for lurking - time constraints, passive personality; Reassurance through seeing strong leadership, strategy; Reassuring to speak to colleagues through networking; Regular posters more useful; Respectful disagreement; Respect online; Retweets = endorsement; Retweets if useful; Scared of asking questions face-to-face with GP; Take learnings without commenting; Twitter use because of COVID-19; Validates who they follow - their background and motivations; Values senior opinion online, uses if leaders use
Credibility	What makes someone credible? Does having more followers / bigger impact equate to information being credible? “Famous physios”. What is a credible information source? Misinformation	N=46 (Dis)trust of dominant voices;(Peer) regulation of Twitter community, call out misinformation, etiquette of use;;Assumed quality and robustness; Assumption websites (more time to create) are more credible; Attention seeking; Balance between credible and interesting content; Business models; Controversy attracts attention; Credibility by Association; Credibility by Experience; Credibility by friendship / colleagueship / familiarity; Credibility by information volume; Credibility by likeability; Credibility by reputation; Credibility by research experience; Credibility by seniority; Credibility of evidence-based source; Credibility track record; Credible professionals under more scrutiny online = trust; Differences between online and offline personas; Dislikes self-promotion; Dismissing others; Distrust of unfavourable accounts; Follow credible people - educators, colleagues, leaders, Multidisciplinary professions, national FCP names, national bodies; Guru led / fame in physiotherapy; Hiding behind online personas, arguments; Importance of self-awareness, awareness of sources; Influencers danger to vulnerable people; Lack of critical appraisal and governance; Misinformation; Notoriety / influencers / opinion leaders equals / does not equal credibility; Online popularity and career advancement; Online professional rivalry; Opinion sharing; Opinion vs fact; Opinionated doesn't mean authority; Opinions not credible; Patients listening to person with lots of followers; Peer pressure; Polarising, extreme, sensational views does not equal credibility; Popularity contest; Presenting yourself online; Quality vs quantity of posts; Respects colleagues who tweet; Superiority attitudes online; Take for granted trusted sources

Bias and echo chambers		N=28 (Un)balanced viewpoints and arguments; Algorithms; Access to wide knowledge base on social media; Assumptions (familiarity); Awareness of misinformation; Bias (confirmation bias, conformity bias, frequency bias, unconscious bias); Blinkered use; Credibility influenced by echo chamber and bias; Culture; Debate and discussion promote diverse information; Difficult to decide who to follow for balance; Echo chamber / not an echo chamber; Echo chambers result in missed information; Follow different people to avoid bias and echo chambers; Group think, following the crowd; Importance of visibility of professional bodies; Influencers (peers, friends of friends, famous physios, paid for); Information accountability; Patients may see singular / physio viewpoints; Personal choice to see diverse information; Polarisation; Reflections of core values; Sales personas; Short Tweet characters lead to bias; Staying with the familiar (own interests, connections); Tweet comments increase diversity of information; Twitter filters to narrow down information; Unconscious bias from Twitter influencing practice
Who to follow		N=19 Senior leadership; academic credibility; colleagues; controversial influencers; familiar names; opinion leaders; after reading Twitter conversations; linked to topic areas; people used to work with; physios involved in research; prominent FCP leaders; research colleagues; similar personalities to self; trusted national bodies; trusted journals
Professionalism	Professional and non-professional attitudes, beliefs, behaviours online	N=43 (Un)professionalism; Always on culture; Blurring professional and personal boundaries (Time, spaces, communication, conduct); Build FCP portfolio on Twitter; Case studies (patient consent, confidentiality); Challenges traditional ideas / expectations of work and development; Different boundaries NHS and private; Divisions obvious online; Ethics (access to patients, research participants, self-promotion); Evolution of CPD to include Twitter (HEE encourages, adds value); Free speech vs self-censorship; Generational social media approaches; Growing clinical Twitter community; In public domain (visibility, scrutiny, repercussions); Monitors and checks relevance of following;

		Multidisciplinary (influences, support, opinions, relationships); Newly qualified clinicians impressionable (Twitter training, mentorship, undergrad); NHS vs private varied online standards; Opportunity to communicate with experts; Patient contact online (worrying, uncomfortable, complaints, harm, safety vs happy, retweet patient info, signposting); Peer pressure; Personal decision making ; Personality on twitter; Positive impact on them as a clinician; Professional body more credible; Professional expertise in appraisal and critique; Professional vulnerability (lack of protection, reassurance, support, training); Promotion of self, the NHS Trust, FCP; Reassurance of clinical practice standards; Representative of an organisation rather than a person; Respect for employer; Risks (reputation, credibility, respect, privacy, communicating misinformation, longevity of posts); Safer to observe; Setting boundaries (follow small numbers, separate accounts); Structured way to appraise Twitter info; Support (training, repercussions); Training / policing / monitoring / code of conduct required; Twitter affects clinical confidence, judgement, reasoning, relevance; Twitter developing the profession; Twitter used by more senior colleagues; Unsocial media; Watch arguments from the side lines; Work time (senior agreement, senior example, unpaid work if outside work time, research time, time demands)
Barriers to use	What stops an FCP using Twitter / using Twitter fully	N=61 Affects personal confidence; Aggression; Anger; Anxiety; Argumentative; Belittling; Boring; Bullying; Cliques; Conflict; Demands; Differences not tolerated well on Twitter; Drama; Ego; Ethical considerations; Extreme views; False sense of confidence; online; Fear; Forceful behaviour; Guilt; Harassment; Hasn't explored Twitter in detail; Hierarchical; Hostility; Ignorance; Inappropriate language; Inflammatory comments; Intimidating; Intrusion; Judgemental environment; Keyboard warriors; Late to social media; Lowered opinion of others; Male aggression; Mental Health; Mob; Narcissism; Negative space; No experience of Twitter; No specific FCP Twitter community; Peer pressure; Privacy; Protecting children; Repetition; Reputation; Resources get lost; Safety; Screen time; Sensationalism; Sleep; Stalking; Stress; Time consuming dealing with negativity; Too wordy; Toxicity; Tribal; Trolls; Twitter storm; Understanding the platform; Unsettling; Workload

Confidence	What encourages / discourages an FCP to use Twitter	N=20 (Lack of) confidence to post and interact; (Lack of) platform competence; Being judged affects confidence; Buzz of being in the loop; Buzz of leading knowledge sharing; Confidence in knowledge / experience; Digital exclusion; Encouragement from leaders / peers; FCP anxiety; Feeling ignored; Imposter syndrome working with GPs; Increased use in pandemic; Lack of confidence linked to lurking; Perceived power dynamics; Personality affects engagement; Self-awareness; Self perceived credibility; Self perceived popularity; Twitter interaction level; Twitter is confidence building
Online communities	Who to follow, why follow people, isolated working, reassurance	N=34 At the coal face together; Career progression; Challenging thinking; Clinical champions; COVID support; Develop relationships; Engagement; Face-to-face colleague interaction; Feeling / not feeling isolated; For multidisciplinary working, support, learning; Global networking; Increased twitter use recently - FCP multidisciplinary focus; Isolated working need for a network; Lack of NHS collaboration sharing knowledge; Learning; Limited time for online networking; Loneliness; Networking following courses, podcasts, webinars; Networking not valuable; Networking via all technologies; Networks advertised; New role support; No FCP Twitter network; Not everyone uses Twitter - exclusion; Reassurance not alone; Reliance; Research collaboration; Senior networking; Thought provoking; Timely way to connect; To ask clinical questions; To learn about roadmaps; To show off good practice / standards; Validation

Appendix 12 e – Table of initial themes 2

Initial themes (n=6)	Theme synopsis	Examples of codes
Knowledge filtering	There is a large amount of knowledge on Twitter, which can paralyse knowledge use and knowledge sharing. Participants face increasing demands on their time, pressure to know all, and are frequently overwhelmed by too much information. Participants filter sources (people) and knowledge (tweets) on Twitter, by; Searching / prioritising trusted sources; Evaluating the content, context and relevance; Appraising and evaluating information using clinical judgement and decision making skills. Reasons for filtering knowledge are; Time demands and the need for quick access to bite sized knowledge; Keeping up to date with the most relevant FCP policy and research knowledge; Ease of accessing pre-appraised / filtered information; Finding credible sources and information for practical use; Using knowledge for clinical practice	Fear of missing out; Critical appraisal of online knowledge; Summarised research; Appraisal of followers; No time for journals; Selective following: Accessibility; Easy to use; Speed of information; Time saving; Translated knowledge; Relevant content; Credibility: Prioritise trusted sources; Prefers papers than screens; Access to research articles: Additional work; Information overload; Overwhelming information: Information at your fingertips
Knowledge discovery	Twitter offers a unique way of discovering knowledge, providing a 'lucky dip' of information. Participants describe a snowballing effect of continuously clicking through links, tweets and people. It provides access to new opinions, contacts, ways of working and experiences. However, the uncertainty can also be stressful and there is concern of 'losing control' of knowledge and opening up the knowledge	Broadens horizons; Expands knowledge; Mindless scrolling; Opportunistic scrolling; Open mind to new knowledge; Thinking differently: Case studies; Challenging opinions: Nuances of knowledge lost; Clinical knowledge sharing; Tweet impact; Practical use of Twitter knowledge; National / local context comparison; Knowledge contexts; Adapting knowledge; Save information for later use

	floodgates. Face-to-face conversation is still preferable in some cases. Once knowledge is 'discovered' and new knowledge types are opened up, knowledge is mobilised in different ways on Twitter. The goal is for it to be of practical use. However, there is a danger of nuances being lost, or knowledge being diluted or missed. Many participants take knowledge from Twitter but do not give knowledge on personal accounts	
Interconnected knowledge	Participants stressed that Twitter is a complimentary source of information or a starting point to accessing new knowledge. Finding knowledge on Twitter often leads to secondary knowledge sharing, both online and offline. Knowledge is connected, it is used on other platforms or in real life. Knowledge also connects people, participants follow a range of professional and personal contacts and national bodies, some are known to them offline, most are not. Reasons for following certain people are multifaceted, but importantly isolated working has led to Twitter being used to boost confidence, seek support and gain reassurance. There is both support for and distrust of online communities amongst participants. There is no specific FCP Twitter community. Twitter connects participants to patients which is mainly viewed as negative	Access to researchers; Building on knowledge foundations; Additional information; Feedback to colleagues; Knowledge movement; Adapt Twitter content; Summarise knowledge; Retweet for onward knowledge sharing; Signposting; Summarising knowledge for others; Twitter stimulates discussion: Career progression; Feeling isolated; Not feeling isolated; Validation; Learning: Knowledge connects people
Engagement behaviours	Most participants define themselves as 'lurkers.' Many lack the confidence to share knowledge for fear of looking unprofessional or encountering hostility, intimidation or	All or nothing; Avoidant behaviour; Professional and personal accounts; Encouraged by others; Lurker; Follow the crowd; Hiding behind handle: Being judged by others; Being in the loop; Feeling

	conflict. There are blurred boundaries between private and professional worlds on Twitter. There is a call for more protection and training in social media, particularly for newly qualified physiotherapists	ignored; Roadmap anxiety; Self perceived popularity; Perceived power dynamics; Lack of time to post; Blurred professional and personal boundaries; Free speech; Multidisciplinary; Patient contact online; Peer pressure; Self promotion
Barriers to use	The factors preventing a participant from using Twitter (non-Twitter users) or using Twitter fully (Twitter users who are lurkers). Social media can be 'unsocial media', it can be a hostile environment, there are risks. Bias and echo chambers are a common problem and can inhibit accurate sharing of diverse knowledge. Physiotherapy ‘influencers’, online cliques and peer pressure promotes bias and sharing of similar viewpoints	Algorithms; Awareness of bias; Debate promotes diversity; Groupthink; Echo chamber means missed knowledge; Polarisation; Unconscious bias: Hostility; Cliques; Fear; Intimidating; Intrusive; Judgemental; Reputation; Safety; Screen time; Workload
Credibility	There is a debate around what makes someone credible; Does having more followers equate to being a credible source of knowledge? Dangers of misinformation	Assumed quality; Attention seeking; Controversy; Popularity vs credibility; Follow credible people; Opinions not credible

Appendix 12 f – Final themes with examples of coded data

Final theme	Final subtheme	Description of theme	Examples of code	Examples of data coded
THEME 1: How Twitter meets the needs of FCPs		**This theme looks at the professional needs of FCPs and how Twitter can play a part in addressing these needs.**		
	Overcoming isolation	The ways in which Twitter can connect FCPs to professional peers when working in isolation (Sharing networks)	Networking	*"It's also great to collaborate with people so you know sometimes you can contact people in different areas who might be running in-service [training] elsewhere or abroad […] it's really great to hear the sharing of practice across different providers and communities and so on". (P18 T)*
			Change in practice	*"I didn't use Twitter as much in rheumatology as I do now and I think it's because the more remote you are, I mean, I work on my own in a room." (P06 T)*
	Rapid access and sharing of knowledge	The ways in which Twitter can rapidly provide easy access to a diverse range of bite-sized	Time saving	*"Especially in FCP time is of the essence. I haven't got a lot of time to mess around. So give me the facts and give me the useful stuff as quick as possible. " (P10 T)*

		knowledge for busy FCPs (Sharing knowledge)	Fear of missing out	*“Because you know you want to try and keep in touch with some of the resources and things out there and not miss stuff […] Oh God it’s like hundreds to look through here and I don’t want to miss something so it can create a little bit of, you know, kind of stress I suppose”. (P18 T)*
	Gaining reassurance from peers	The ways in which Twitter provides validation and reassurance for a newly created professional workforce of FCPs (Sharing reassurance)	Reassurance not alone	*“Especially with the roadmap, you think you want some support […] is it only me that’s stressed about it or is everybody thinking the same thing or you know is there something that I’m missing out, is there something that I didn’t know about. So it’s that kind of support, even though you don’t get factual information, it’s people talking about things and they’re having, they’re going through the same things like we’re going through”. (P14 T)*
			Validation	*“It felt like a lot of people were saying and thinking the same things that I was and it was nice to be validated.” (P08 T)*
THEME 2: Twitter and a journey of knowledge to support clinical practice		**This theme describes the way FCPs find, appraise, adapt and share knowledge on Twitter to translate knowledge into practice**		

	Discovering a 'lucky dip' of new knowledge	How FCPs find and engage with new knowledge on Twitter	Pragmatic use for practice	*"For me it's always like, 'This has been published today, see the link, see the full access to the link on here.' And I think, 'Brilliant, I'll click on that.' That would be what gets me cos I think, 'Right I can easily access that.'" (P07 T)*
			Opportunistic scrolling	*"It's about control really….and a bit of discipline about using it for what you want to use it for rather than it taking over. But I've done that myself, millions of times. Even to stuff that I have absolutely no interest in. Something has gone off and you think, 'Oh they've got me again, how has that happened?' and I've gone down the rabbit hole. It wasn't even funny or I didn't get anything out of that, but I've spent probably half an hour just scrolling through." (P08 T)*

			Key tweet ingredients	*"I think pictures will often kind of illustrate an idea or kind of get you more involved."* (P02 T)

	The need to filter new knowledge	How FCPs filter sources and content on Twitter for credibility	Credibility of information	*“Similar to fake news, you have to find three or four things that you can identify the source from and that are good quality evidence.” (P12 T)*
			Popularity vs credibility	*“I think, you know, perhaps someone having lots of followers, some people might think that might mean that they’re more likely to spread helpful information, kind of thing.” (P13 T)*

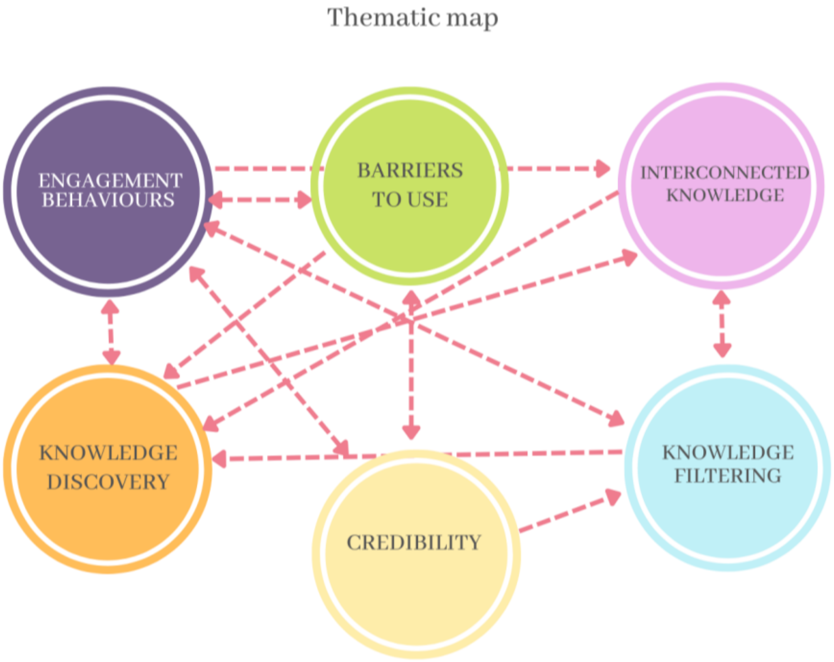
			Assumed quality	*"Of course the national bodies are pretty robust because a lot of that has already been filtered, so I'm aware, I'm aware that's already been reviewed before it's been put out so that's pretty trustworthy." (P01 T)*
	Adapting and using knowledge	How FCPs adapt and new knowledge from Twitter for clinical practice and share through different channels	Knowledge brokering	*"And then often the stuff I pull off I then share with the team […] So for example when the MSK standards came out the other week, the first place I saw them was on Twitter. So I read them, summarised them for the team, put a little PowerPoint presentation together for the whole service and said, look it's 72 pages, I don't anticipate everyone's going to spend time reading 72 pages of this document but these are the key points". (P18 T)*
			Clinical case study	*"Yeh so you have a lot of like, case studies out there, people's like, patient experience, so for example in FCP, there's quite a few people that will put tweets out going right, I've had x y and z as a case study, give a clinical scenario, would you look at bloods in this situation, would you look at imagery, and it can start quite a useful clinical conversation in that regard." (P01 T)*

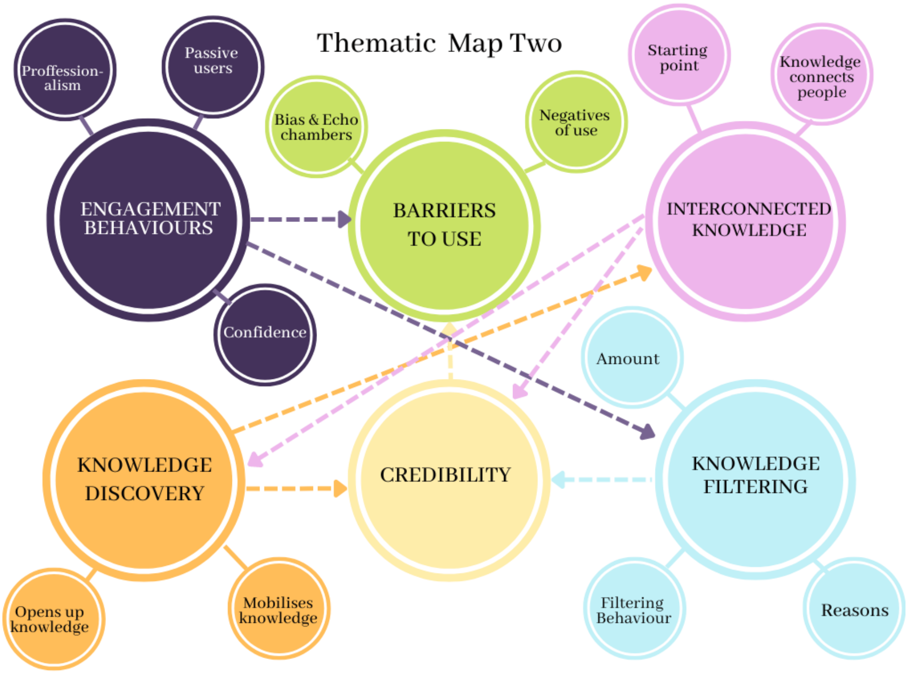
			Echo chamber	*“There is a big risk as clinicians as we develop to one school of thought because we follow the people we agree with only. And then we end up causing, not harm but possibly missing out on a lot of good information.” (P12 T)*
THEME 3: Factors impeding knowledge sharing on Twitter		**This theme describes how factors unique to the online space can be detrimental to knowledge sharing**		
	Maintaining professional standards on an unregulated online platform	The ways in which professional behaviour appears to change on Twitter	Professionalism	*“So yeh you might rant to a friend and swear your head off but in a professional context you would never do that. But Twitter is this kind of half way between the two and so I think sometimes it goes a bit too far into the personal opinions and how you would behave when no-one else is watching, but everyone’s watching.” (P02 T)*

			Social media education	*"I feel like as part of the uni courses that needs to be something that they need to teach and it needs to be part of the prospectus that they need to kind of cover, 'Where do we sit with social media and how do you make your clinical judgements?'" (P07 T)*
	Not fully engaging with Twitter	The ways in which using Twitter passively can prevent knowledge sharing	Hostility	*"You're doing something, or managing a service a certain way, or behaving in a certain way with your patients, and somebody disagrees, it can be quite a volatile place." (P01 T)*
			Lurking	*"I tend to be quite quiet on there, I don't have a lot of people following, I don't do a lot of Tweeting, I do a lot of looking and seeing." (P06 T)*

	Concerns regarding Privacy and blurred clinical boundaries	How clinical boundaries differ on Twitter to real life, causing confusion and concerns for privacy	Boundaries	*"But it's still, that's my time. I don't want you impinging, I will see you in my clinic when it's your appointment, but I don't want you having access, to be in my thoughts and what I'm doing when I'm not at work. Because that's not the deal." (P02 T)*
			Privacy	*"A patient came in and he had me saved as his screensaver where he'd found me on Facebook. It was me and my little boy and he'd got it as like a screenshot and saved it as his screensaver on his mobile which freaked me out. I asked him obviously to remove it, but his English was terrible...... so that's another reason why I'm not really active at putting stuff on cos it's easier to be – you know, from a security point of view. But I do say this to staff, cos they put all their family information, their kids, their full name, you can see their house. It is really easy for people to be found then." (P07 T)*

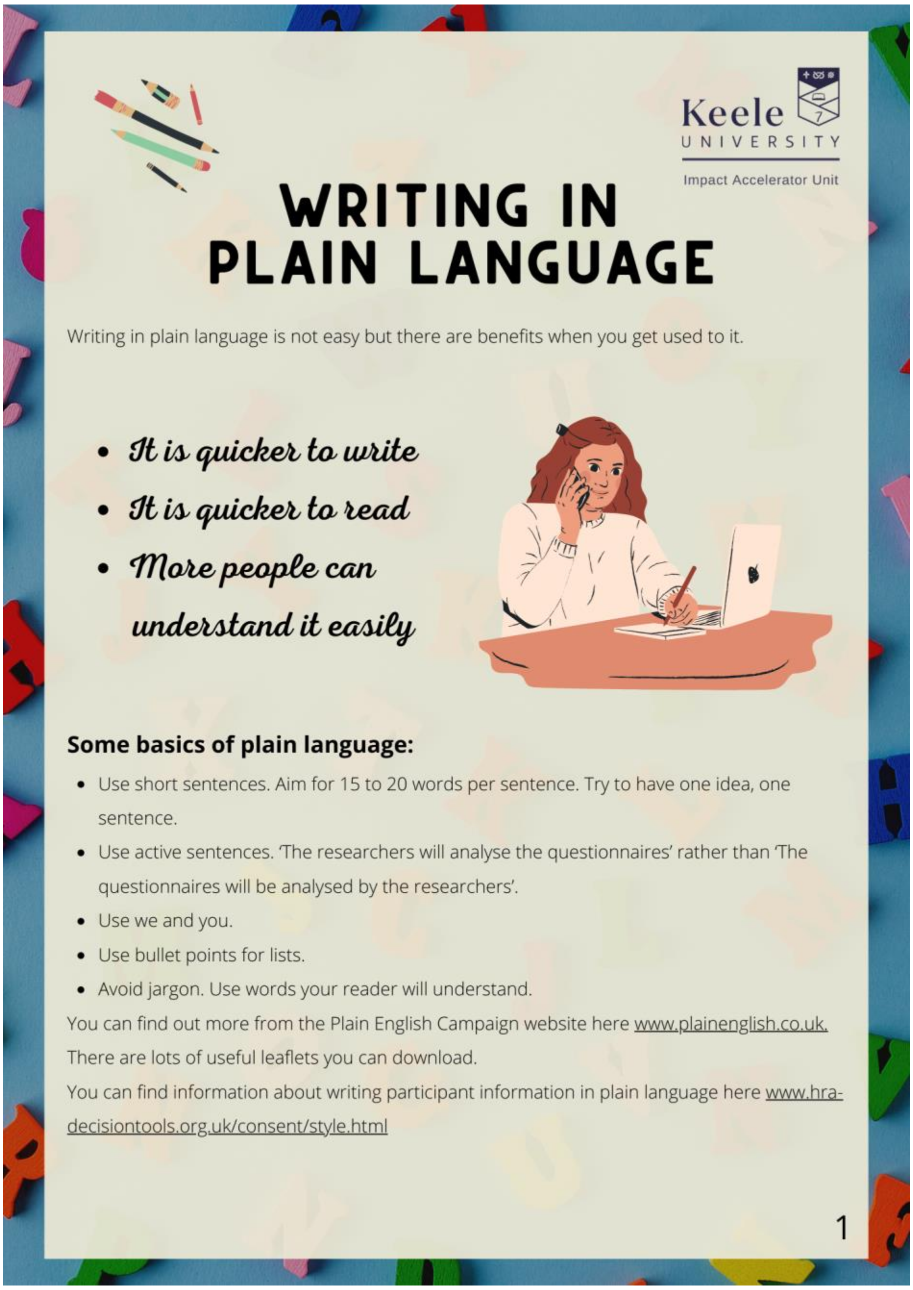
Appendix 12 g – Thematic maps





Appendix 13 – Plain language guides

These guides were co-developed by Linda Parton (Link Group member), Adele Higginbottom (IAU PPIE Officer) and Laura Campbell.



Keele University

Impact Accelerator Unit

WRITING IN PLAIN LANGUAGE

Writing in plain language is not easy but there are benefits when you get used to it.

- *It is quicker to write*
- *It is quicker to read*
- *More people can understand it easily*

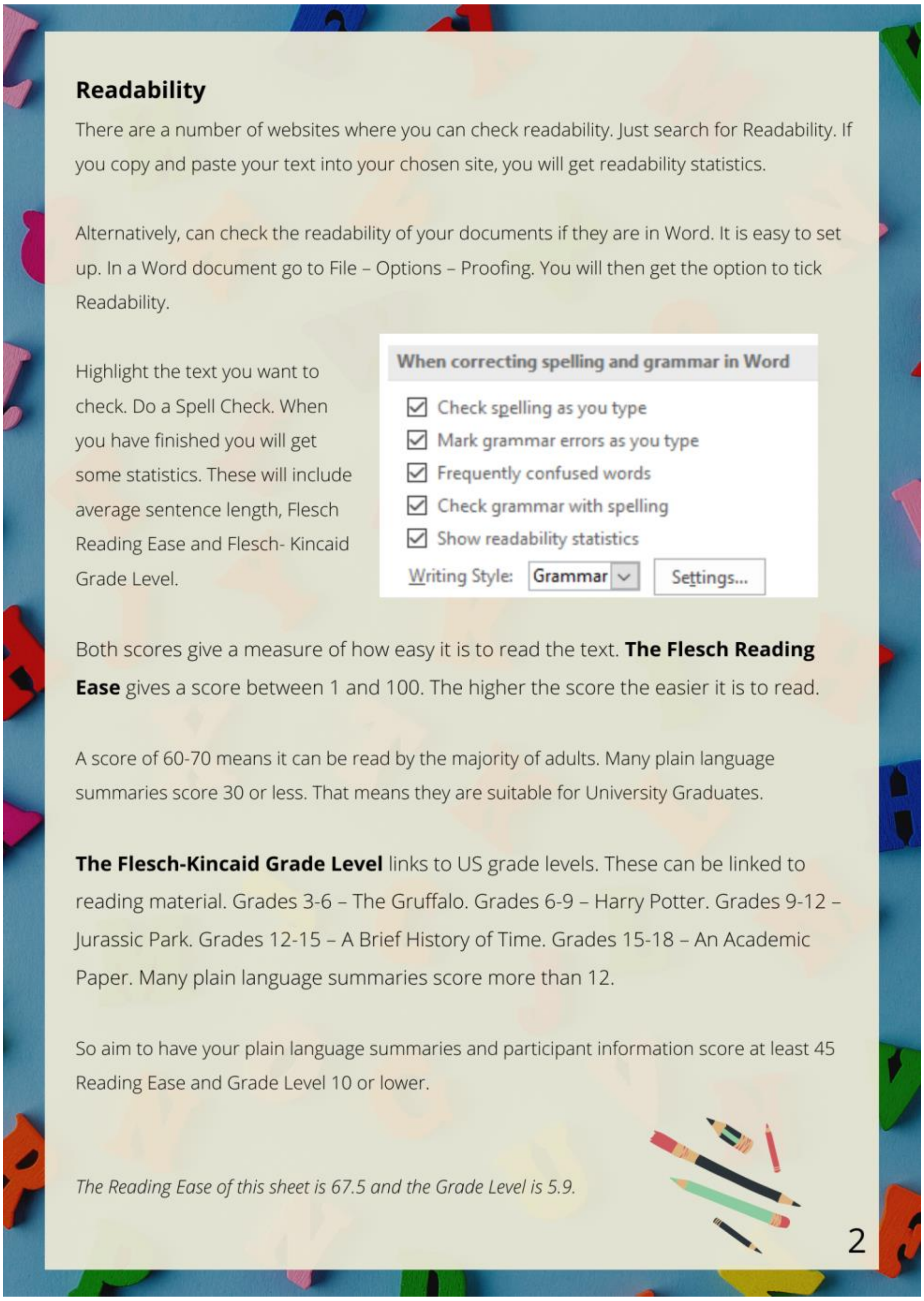
Some basics of plain language:

- Use short sentences. Aim for 15 to 20 words per sentence. Try to have one idea, one sentence.
- Use active sentences. 'The researchers will analyse the questionnaires' rather than 'The questionnaires will be analysed by the researchers'.
- Use we and you.
- Use bullet points for lists.
- Avoid jargon. Use words your reader will understand.

You can find out more from the Plain English Campaign website here www.plainenglish.co.uk. There are lots of useful leaflets you can download.

You can find information about writing participant information in plain language here www.hra-decisiontools.org.uk/consent/style.html

1



Readability

There are a number of websites where you can check readability. Just search for Readability. If you copy and paste your text into your chosen site, you will get readability statistics.

Alternatively, can check the readability of your documents if they are in Word. It is easy to set up. In a Word document go to File – Options – Proofing. You will then get the option to tick Readability.

Highlight the text you want to check. Do a Spell Check. When you have finished you will get some statistics. These will include average sentence length, Flesch Reading Ease and Flesch- Kincaid Grade Level.

When correcting spelling and grammar in Word

☑ Check spelling as you type
☑ Mark grammar errors as you type
☑ Frequently confused words
☑ Check grammar with spelling
☑ Show readability statistics

Writing Style: Grammar

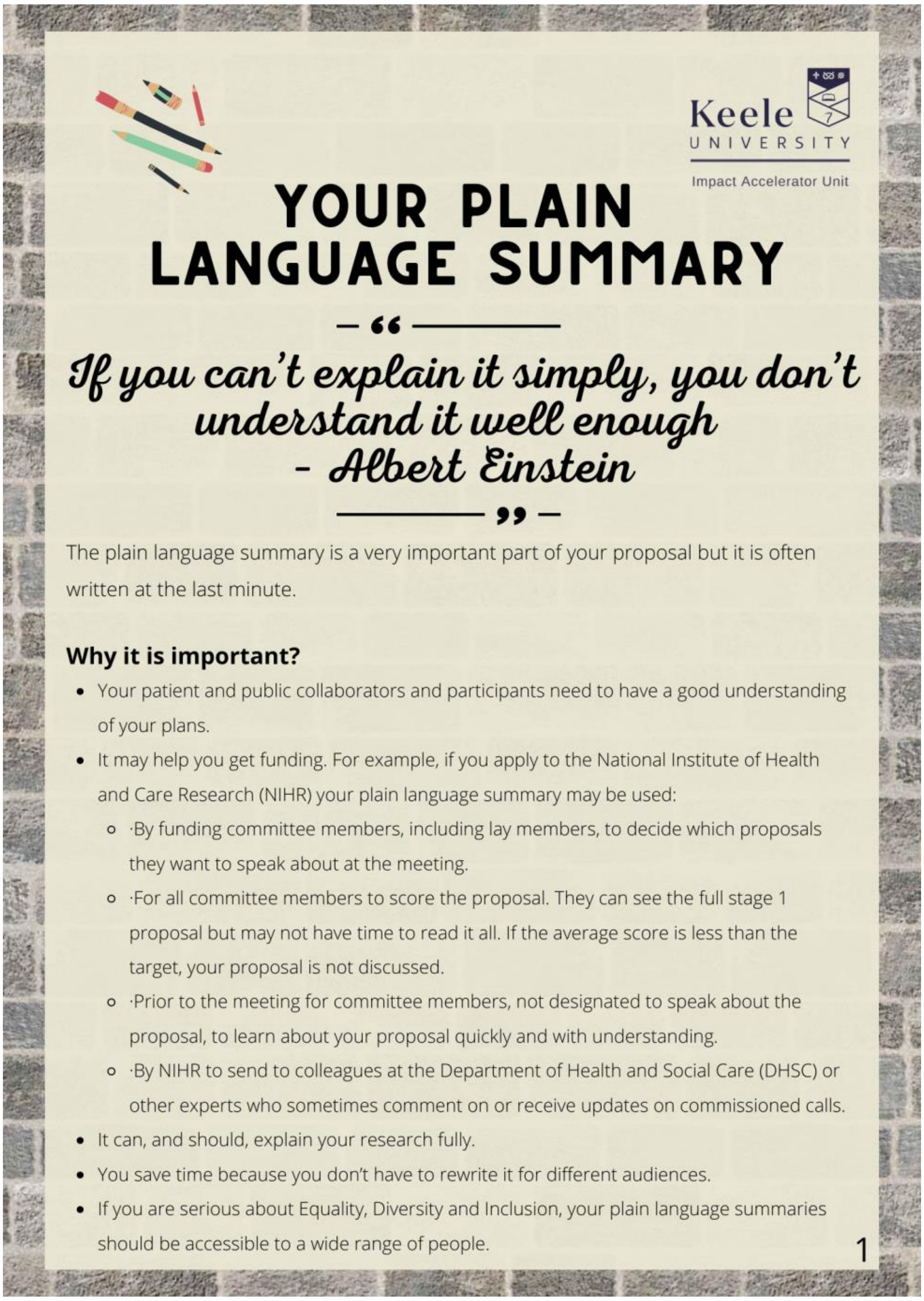
Both scores give a measure of how easy it is to read the text. **The Flesch Reading Ease** gives a score between 1 and 100. The higher the score the easier it is to read.

A score of 60-70 means it can be read by the majority of adults. Many plain language summaries score 30 or less. That means they are suitable for University Graduates.

The Flesch-Kincaid Grade Level links to US grade levels. These can be linked to reading material. Grades 3-6 – The Gruffalo. Grades 6-9 – Harry Potter. Grades 9-12 – Jurassic Park. Grades 12-15 – A Brief History of Time. Grades 15-18 – An Academic Paper. Many plain language summaries score more than 12.

So aim to have your plain language summaries and participant information score at least 45 Reading Ease and Grade Level 10 or lower.

The Reading Ease of this sheet is 67.5 and the Grade Level is 5.9.



Keele
UNIVERSITY
Impact Accelerator Unit

YOUR PLAIN LANGUAGE SUMMARY

> "If you can't explain it simply, you don't understand it well enough
> - Albert Einstein"

The plain language summary is a very important part of your proposal but it is often written at the last minute.

Why it is important?

- Your patient and public collaborators and participants need to have a good understanding of your plans.
- It may help you get funding. For example, if you apply to the National Institute of Health and Care Research (NIHR) your plain language summary may be used:
  - ·By funding committee members, including lay members, to decide which proposals they want to speak about at the meeting.
  - ·For all committee members to score the proposal. They can see the full stage 1 proposal but may not have time to read it all. If the average score is less than the target, your proposal is not discussed.
  - ·Prior to the meeting for committee members, not designated to speak about the proposal, to learn about your proposal quickly and with understanding.
  - ·By NIHR to send to colleagues at the Department of Health and Social Care (DHSC) or other experts who sometimes comment on or receive updates on commissioned calls.
- It can, and should, explain your research fully.
- You save time because you don't have to rewrite it for different audiences.
- If you are serious about Equality, Diversity and Inclusion, your plain language summaries should be accessible to a wide range of people.

What makes a good plain language summary?

- It is written in plain language and readability levels are not too high. See the plain language information.
- You co-write the plain language summaries with public and patients.
- Use suitable headings and white space. A block of text is off-putting.
- Headings could be:
  - ***The Issue.*** What are you trying to improve? Try to state this in the first sentence. Then you can give further information such as what you already know, effects of the issue, links to priorities etc..
  - ***Aims and Plans.*** What are you hoping to achieve? How will that help to address the issue? How are you going to carry out your research? How will you recruit participants? Will you be producing any outputs?
  - ***Involving the Public.*** How have public and patients been involved in the development of your plans? Has anything changed because of their input? How will public and patients be involved throughout the research and dissemination?
  - ***Sharing our Findings.*** How will you share your work with a wide range of people? Everyone writes academic papers and presents at conferences. Be innovative. How will sharing your findings lead to implementation?
  - ***Impact.*** How will your research benefit patients and public? It could be an indirect benefit but it should be clear.
- Don't use jargon or acronyms, unless you explain them. Use everyday language e.g. *'risk of dying early'* instead of *'risk of premature mortality'*.

Checking your plain language summaries

- Ask a lay person, who knows nothing about your research, to read it and say if they understand it. Don't just ask your regular patient and public involvement members. They will have picked up some of your 'academic speak'.
- Ask a fellow researcher, who does know about your research, if the plain language summary could be used on its own to describe the proposed research.

NIHR also have information on plain language summaries
www.nihr.ac.uk/documents/plain-english-summaries/27363