Table 1: Context, purpose and remit of MSK research priority setting exercise

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| Long-term goal | To improve the quality and impact of research which seeks to develop our understanding and management of MSK disorders.     * to enhance prevention, early detection and treatment and care of MSK disorders * to improve the quality of life and wellbeing of those with MSK disorders * to reduce personal, social and economic burden of MSK disorders |
| Population of interest | People (aged 18 or over) with, or at risk of MSK disorders, their families, carers and healthcare providers.  MSK disorders defined as osteoarthritis, crystal disease such as gout, primary and secondary causes of MSK pain including regional and widespread pain (such as back pain, shoulder pain and tendinopathy, other regional pain syndromes and fibromyalgia), hypermobility, metabolic bone disorders (such as osteoporosis and rare diseases) and MSK injuries caused by acute traumatic events.  Participants and research questions within the United Kingdom (UK) were identified as the main focus, although the findings may well have relevance beyond the UK. |
| Timeframe for impact | Both within, and beyond 3 years (0-3 years (short term), >3 years (longer term) |
| Research Domains identified a priori  (Shortened name) | * **Diagnosis and impact** (Diagnosis)   + Achieving an early and accurate diagnosis   + Measuring the true impact of musculoskeletal disorders on individuals and on society   + Maximising the potential of electronic health records * **Living well with MSK disorders** (Living well)   + Improving self-management and support in the home or community   + Improving any aspect of healthcare treatment * **Mechanisms of disease** (Mechanisms)   + Understanding the causes and development of musculoskeletal disorders   + Disease processes shared between disorders * **Successful translation** (Translation) * Ensuring that research-proven tests, treatments and approaches are routinely available in clinical practice * Enabling discoveries to move from the laboratory to the clinic, towards patient benefit |
| Audience | * People with MSK disorders * Researchers of all stages * Healthcare professionals * Funders and other agencies who influence the funding and research strategy of MSK disorders * Industry, such as pharmaceutical and medical technology companies |

Table 2: Characteristics of responders to both e-surveys

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|  | E-survey 1 (n= 213) | E-survey 2  (n=189 completed demographic data) |
|  | n (%)  NA – Not applicable, question not included in survey | |
| Gender  Male  Female  Unstated | NA | 60 (31·7)  117 (61·9)  12 (6·3) |
| **Ethnicity**  White: British/English/Scottish/Welsh/Northern Irish  Any other white background  White: Irish  Any other Asian background  Asian or Asian British: Indian  Black or Black British: African  Mixed (please state)  Asian or Asian British: Pakistani  Black or Black British: Caribbean  Asian or Asian British: Chinese  Any other ethnic group  Skipped | NA | 131 (69·3)  17 (9·0)  4 (2·1)  2 (1·1)  2 (1·1)  2 (1·1)  2 (1·1)  1 (0·5)  1 (0·5)  1 (0·5)  1 (0·5)  25 (13·2) |
| **Age**  18-29  30-39              40-49              50-59              60-69              70-79              80-89              Skipped | NA | 5 (2·6)  21 (11·1)  37 (19·6)  50 (26·5)  40 (21·2)  25 (13·2)  4 (2·1)  7 (3·7) |
| **Nature of interest in MSK disorders**  Lay responder  Person with a musculoskeletal disorder/patient  Member of public with an interest in a condition or area  Carer  Patient support organisation  Healthcare professional  Researcher  Clinical  Non-Clinical  Other  Charity/funding agency  Industry/commercial  Policymaker/government agency  Skipped  Other (specified in free text box) | 76 (35·7)  6 (2·8)  0 (0)  1 (0·5)  41 (19·2)  47 (22·1)  32 (15·0)  0 (0)  4 (1·9)  0 (0)  0  6 (2·8) | 64 (33·9)  8 (4·2)  2 (1·1)  1 (0·5)  43 (22·8)  29 (15·3)  29 (15·3)    1 (0·5)  0 (0)  0 (0)  1 (0·5)  11 (5·8) |

Table 3: Ranked Research Avenues

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| **Rank** | **Research Avenue**  *Within each rank, Avenues are presented in alphabetical order* | **Score** | **Domain**  *D – Diagnosis*  *LW – Living well*  *M – Mechanisms*  *T- Translation* |
| 1 | Develop and test new treatments to prevent or reduce progression of MSK conditions. | 18 | LW |
| 2 | Identify the best ways to manage pain and/or improve quality of life. | 16·5 | LW |
| 3 | Develop and test approaches to help people with MSK conditions make lasting changes to improve their health. | 16 | LW |
| 3 | Develop and test ways to target and personalise treatments to each individual. | 16 | LW |
| 3 | Find out how to improve accurate and earlier diagnosis of MSK conditions. | 16 | D |
| 3 | Find out more about the benefits, safety and best ways to use exercise and/or rehabilitation. | 16 | LW |
| 3 | Identify biological targets to develop new treatments which change the course of disease. | 16 | M |
| 3 | Identify disease processes that will allow better targeting of treatment to improve people’s outcome. | 16 | M |
| 3 | Identify how to earlier predict the progress of MSK conditions. | 16 | M |
| 3 | Identify the best way to deliver the best support and information to help people effectively self-manage their condition. | 16 | LW |
| 3 | Identify the surgical techniques, technologies and implants that help people the most. | 16 | LW |
| 3 | Identify tools, tests and markers that can diagnose disease at an early stage and inform whether the disease will progress and respond to treatment. | 16 | M |
| 3 | Investigate how best to combine treatments. | 16 | LW |
| 3 | Study biological disease processes to identify ways to predict if MSK conditions will develop or if existing conditions will progress during someone’s lifetime. | 16 | M |
| 3 | Study how chronic pain develops. | 16 | M |
| 3 | Study how new clinical, biological and genetic and technology approaches can monitor the effectiveness of treatments. | 16 | T |
| 3 | Study how new clinical, biological, genetic and technology approaches can improve diagnosis. | 16 | T |
| 3 | Study the effect of lifestyle (e.g. work and exercise) on how MSK conditions develop and progress. | 16 | M |
| 3 | Study whether a better understanding of disease processes can be used to develop new ways of preventing MSK conditions. | 16 | M |
| 3 | Test new ways of making sure the right person gets the right treatment. | 16 | D |
| 3 | Understand disease processes so that we can better identify differences (subgroups of people) within the same condition. | 16 | M |
| 3 | Understand how MSK tissues repair themselves and how this could be enhanced to improve MSK conditions. | 16 | M |
| 3 | Understand the best ways of providing research-proven treatments to people, including where, when and by whom. | 16 | T |
| 3 | Understand the links between tissue damage and pain. | 16 | M |
| 3 | Understand why people’s pain experiences are different and why some people develop chronic pain when others do not. | 16 | M |
| 4 | Understand the biological links between MSK conditions and other illnesses. | 15·5 | M |
| 5 | Develop and test approaches to identify and help people with MSK conditions who need psychological support. | 15 | LW |
| 5 | Develop better ways to overcome the known difficulties in the process of turning a possible effective treatment into a safe, licensed product. | 15 | T |
| 5 | Find better ways to speed up the uptake of research results into treatment guidelines and policy. | 15 | T |
| 5 | Identify and find ways to address gaps in healthcare professional knowledge about MSK conditions. | 15 | LW |
| 5 | Identify the best approaches to improving communication about MSK conditions between patients and their healthcare professionals. | 15 | LW |
| 5 | Identify the best ways to improve outcomes after surgery. | 15 | LW |
| 5 | Improve how information from lab-based research and clinical trials is used to safely speed up making the best treatments available. | 15 | T |
| 5 | Investigate ways to speed up the process of turning scientific research findings into effective treatments. | 15 | T |
| 5 | Study how diet and gut bacteria can change the risk of developing MSK conditions. | 15 | M |
| 5 | Study how genes or ethnicity affect how MSK conditions develop. | 15 | M |
| 5 | Study how injury can lead to an increased risk of developing MSK conditions. | 15 | M |
| 5 | Study the role of inflammation in ‘non-inflammatory’ MSK conditions. | 15 | M |
| 5 | Understand and overcome the barriers preventing research-proven tests and treatments being put into practice. | 15 | T |
| 5 | Understand how key biological disease processes drive development and progress of MSK conditions. | 15 | M |
| 5 | Understand how sex hormones and menopause change the risk of MSK conditions. | 15 | M |
| 6 | Better understand the benefit, safety and use of existing medicines, including injections. | 14 | LW |
| 6 | Decide the best ways of delivering remote care for people. | 14 | LW |
| 6 | Define the risk factors in MSK conditions that might predict important outcomes or enable screening. | 14 | D |
| 6 | Identify any groups of patients or patterns within a condition which inform on the course or outcomes of MSK conditions. | 14 | D |
| 6 | Identify the best aids, supports and other devices to help people live well. | 14 | LW |
| 6 | Identify the best lifestyle interventions. | 14 | LW |
| 6 | Set up and test new ways of using electronic health records for accurate, earlier diagnosis and personalised monitoring. | 14 | D |
| 6 | Set up and test whether patients holding their own health data records helps them better manage their condition and make decisions with their clinician. | 14 | D |
| 6 | Study if making changes to risk factors can prevent or delay the start of MSK conditions. | 14 | D |
| 6 | Study the best way of bringing together scientists, clinicians, industry, policy makers and people with MSK conditions to improve the development of early research towards better available treatments. | 14 | T |
| 6 | Study the best way of sharing the results of research with clinicians, scientists, policy makers and people with MSK conditions. | 14 | T |
| 6 | Study the best ways to measure the true effects of MSK conditions on individuals. | 14 | D |
| 6 | Test artificial intelligence approaches to analyse electronic health records and other large databases, (e.g. of x-rays or scans) to improve care. | 14 | D |
| 6 | Test how clinical tools, tests and markers can improve diagnosis. | 14 | D |
| 6 | Understand and address the reasons why everyone with a particular MSK condition does not have the same access to care. | 14 | LW |
| 6 | Understand and address the reasons why everyone with MSK conditions does not receive minimum standards of care. | 14 | LW |
| 6 | Understand and address the reasons why people have difficulty or delays accessing care. | 14 | LW |
| 6 | Understand and meet people’s needs for monitoring and review of their condition. | 14 | LW |
| 6 | Understand how having an early diagnosis affects people, healthcare, and society. | 14 | D |
| 6 | Understand the best ways to diagnose and describe MSK conditions. Define features of relevant smaller groups within the same condition which make a difference to outcomes or care. | 14 | D |
| 6 | Understand the links between MSK and other long-term conditions, and the effect they have on people, work and society. | 14 | D |
| 6 | Understand the reasons why diagnosis is sometimes delayed, and how best to reduce delays. | 14 | D |
| 7 | Find out how to produce a better estimate of the true cost of long-term MSK conditions to people and society. | 13 | D |
| 7 | Understand how changes in society, work and people’s circumstances, including finances, might lower the risk or effects of MSK conditions. | 13 | D |
| 8 | Study the pros and cons of screening for MSK conditions for people, healthcare and society. | 12 | D |
| 8 | Study whether increasing public awareness of MSK conditions will encourage people to have a healthier lifestyle, get an earlier diagnosis and better care. | 12 | D |
| 8 | Study whether new ways of collecting and using standard health data will improve people’s care and help society. | 12 | D |