HK79: What tool or instrument should we utilize to determine the success of treatment of patients with PJI?

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Response/Recommendation: We recommend that patient reported outcome measures (PROMS), informed by consumers, should be prioritised over infection eradication, unplanned operations and ongoing antibiotic use in the next generation of reporting tools for PJI."

Level of Evidence: Low
Delegate Vote:

Rationale:

Standardised reporting of outcomes following PJI is essential to enable comparisons between different treatment modalities and for understanding geographical and temporal trends for PJI outcomes. This need applies to observational, epidemiological and randomized controlled studies. Numerous approaches to defining 'success' as a dichotomous composite outcome have been proposed which have variably included infection eradication, the need for ongoing antibiotics, laboratory and radiological findings or the need for further surgical management as individual components. In preparation for ICM meetings in 2013 and 2018, the Musculoskeletal Infection Society (MSIS) proposed reporting tools, both of which attempted to account for the multi-dimensional nature of outcomes for managing PJI, largely defined by clinicians and experts.[1, 2] To date, PROMS such as joint function or quality of life have not been included as part of standard outcome reporting tools and (to our knowledge) consumers have not been involved in proposing relevant outcomes.

To evaluate which tool or instrument should be utilized as a reporting tool determine success, we performed a systematic review. PubMed and Embase databases were searched (Appendix 1) from 1990 to December 2024. Studies were limited to humans and in English. RCTs were included, regardless of language or time period. After being imported into COVIDENCE and after de-duplication, titles and abstracts were reviewed. Publications were included in the narrative synthesis if they were any of i) RCT or large (>500 participant) prospective observational studies, ii) systematic reviews or comparisons between PJI outcome reporting tools, iii) Delphi or consensus studies proposing outcomes or iv) studies of consumer preferences of patient-reported outcomes for PJI. Citations within these papers and the 'grey literature' were also searched. 15 publications were included in the final narrative synthesis (Figure 1). Due to variation in aims and methodologies, no quantitative synthesis was performed. Of note, the search strategy captured only two RCTs.[3, 4] However, a systematic review of the design characteristics of the published 15 PJI RCTs highlights the variation in outcome reporting across PJI literature. Terms including 'cure', 'remission', 'clinical success', 'treatment failure' and 'reinfection' were used as synonyms for a good or poor outcome where a dichotomous outcome was reported, but there was no consistency in how these were determined.[5] Only one trial used a patient-reported outcome measure as a primary endpoint.[6]

In 2013 a Delphi consensus among clinical experts proposed an outcome reporting tool for success, consisting of all of the following: eradication of infection, no PJI-related mortality and no subsequent surgical intervention after reimplantation surgery.[1] One critique of this tool is that it only applied to PJI managed with 2-stage revision; patients managed with debridement and implant retention or single stage revisions are unclassifiable. A subsequent 4-tiered multidimensional tool was discussed at the 2018 ICM [7] and subsequently published in 2019. [2] This tool achieved strong consensus amongst the delegates. Success was defined as Tier 1 and 2 which included infection control without and with continued antibiotic therapy, respectively. Six substrata within tier 3 were proposed to account for the need for, and timing of, subsequent unplanned operations. Tier 4 related to all-cause mortality.

In the present review we identified two retrospective studies which compared success rates between these reporting tools for patients undergoing 2 stage revision procedures.[8, 9] Both reported lower 'success' for the 2013 (55% and 56%, respectively) compared with the 2019 reporting tool (70% and 81% , respectively). In another evaluation of the 2019 outcome reporting tool, a recent systematic review extracted data from 245 PJI studies and applied the reported outcome to the 2019 tool. Across all of these studies, tier 1 (40.7%) and tier 3 (54.5%) are the dominant criteria defining success. After adjusting for other factors, studies with stricter definitions had lower PJI treatment success. Tier 2 and tier 4 definitions were infrequently used.[10] The authors also noted that study quality, reflected by the methodological index for non-randomised studies (MINORS) score did not improve, concluding the need for improved study design and clarification of the definition of treatment success.[10]

The negative impact of PJI on PROMS is well documented, but rarely applied as endpoints in clinical studies. One of the challenges in standardising PROMS as accepted endpoints is the variety of tools available, though Oxford Joint Scores and Western Ontario and McMaster University (WOMAC) as joint scores and SF-12 and EQ-5D as quality-of-life scores are widely used. The Oxford Scores have a comprehensive evidence base to support their use following arthroplasty but their use as tools for monitoring the impact and outcomes following PJI is less clear. The QoL scores are normalised to age-adjusted norms, enabling direct comparisons with the general age-matched population. Joint scores may be constrained by a skewed distribution and a ceiling effect.

In this review, we identified analyses from a large prospective study of PJI in NZ and Australia which looked at Oxford Joint Scores [11] and SF-12 scores collected at baseline and 12 months.[12] In addition to reporting absolute values at 12 months and change scores, the authors proposed 'good' dichotomous outcomes, which could be applied in clinical trials. Based on previously defined thresholds anchored to patient reported treatment success, a successful outcome at 12-months was defined for knee PJI cases as an OKS at 12 months of >36 or an improvement from baseline of >9 and for hip PJI an OHS of >38 or an improvement of >12. [13] For SF-12 scores, a good quality of life was SF-12 PCS score of > 50 on the SF-12v2 (that is, above the age-adjusted population mean) or an increase of > 8.9 or more from baseline. In both, conventional reported success was strongly associated with 'good' PROMS.

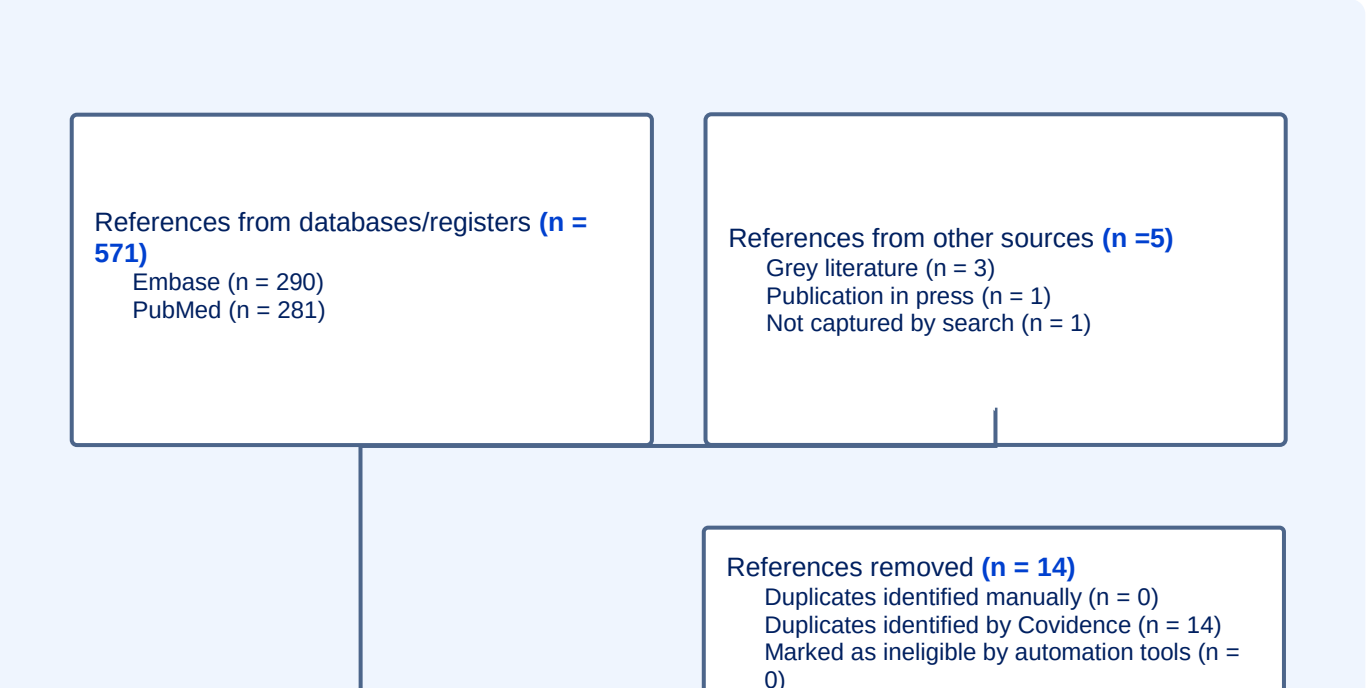
We identified a study which reported a Delphi analysis and discrete choice experiments of a desirability of outcome ranking (DOOR) score among clinical experts. In order of importance, the ordinal DOOR score prioritised all-cause mortality, patient-reported joint function and clinical cure into a 5-point ordinal score which could be applied in comparative observational studies and clinical trials. [14]

The importance of patient involvement in defining the most meaningful endpoint is highlighted in an *in press* manuscript identified as part of the broader search. This methodologically robust qualitative study sought to analyse experiences of patients at least 1 year from PJI diagnosis. In defining successful PJI management, patients consistently emphasized the importance of function, pain relief, mobility, and independence. Nine of the patients (33.3%, $p<0.001$) did not agree with their 2019 reporting tool classification of success versus failure; mainly because it did not capture factors associated with their quality of life post-treatment.[15] Finally, efforts to define core outcome sets for reporting PJI were identified in the grey literature. The results of these are awaited, but crucially in these Delphi analyses, consumers with lived experience of PJI as well as clinical experts. [16, 17]

Defining the optimal tool to define success of treatment for patients PJI is difficult due to the multi-dimensional nature of goals of therapy which include infection eradication, optimal function and quality of life as well as consideration of resource utilisation. Current used reporting tools have been widely used, but do not include patient reported outcome measures (PROMS) and have not been informed by consumers with lived experience of PJI.

We recommend that PROMS which are informed by consumers should be prioritised over infection eradication, unplanned operations and antibiotic use in the next generation of reporting tools for PJI. We note that defining a 'good' outcome for PROMS may present significant challenges. Other approaches such as an ordinal score (DOOR) which integrate PROMS with traditional measures of success have promise. In situations where traditional definitions of success are applied, we recommend complete transparency in how each of the dimensions are ascertained. For definitions of success, each component of the composite should be reported separately.

Figure 1. PRISMA Flow Diagram



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