

The failure of survivorship

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This editorial considers the shortcomings of assessing outcome after joint replacement only by the survival of the implant.

Survivorship of a prosthesis is used as an objective outcome measure to determine whether surgery has been a success or a failure. It is clearly important to know the length of time that an implant has remained in place so that any early failure of a new implant may be identified. However, to define a successful outcome solely on implant survivorship is inadequate and lacks sensitivity. Because revision is uncommon, large sample sizes and long-term follow-up are needed to detect significant differences in survival rates between implants.¹ If an operation is only defined as having failed if it is revised, then patients with a poor outcome who have not been offered revision surgery or elect not to undergo further surgery will not be captured. This results in an overly optimistic representation of the success of joint replacement. From the patient's perspective, success of their joint replacement is unlikely to be judged solely on how long the implant remains in place. Whereas survival analysis would classify an implant with a 15-year survivorship as a success, the patient is unlikely to agree if they have experienced persistent joint pain and disability during that time. Therefore, it is imperative that outcome assessment in orthopaedics moves beyond defining success by survivorship alone and routinely incorporates patient-reported outcome measures (PROMs).

Research using PROMs has revealed a subgroup of patients (approximately 10% to 30% of total knee replacements (TKRs)² and 10% to 15% of total hip replacements (THRs)³ who report persistent pain and functional limitation after surgery. Survival analysis is unable to identify those patients for whom surgery has failed to relieve their pain and disability. However, by incorporating measures of pain, disability and dissatisfaction into the definition of failure alongside revision, a more accurate assessment of outcome can be made. For

example, in one series of TKRs, the survivorship at seven years using revision surgery as the endpoint was 98%, but this decreased to 75% when moderate to severe pain was added as a second endpoint.¹ Similarly, Bullens et al⁴ described a cohort of patients who underwent TKR, in which success was measured in three different ways. The rate of success defined purely by survivorship was 96.7%. When defined as survivorship plus satisfaction > 80 of 100 on a visual analogue scale (VAS), the rate of success was only 73.3%. When success was defined as survivorship plus satisfaction plus resolution of pain (defined as pain < 20 of 100 on a VAS), the success rate dropped to 68.8%.⁴ For THR, the 14-year implant survivorship of the Stanmore prosthesis has been seen to decrease from 86% to 80% when moderate to severe pain was included as an endpoint.⁵

Particular caution needs to be taken when using survivorship analysis alone to compare different ways of treating the same condition, for example when comparing unicompartmental knee replacement with TKR, or resurfacing of the hip with THR. The ease of revision differs and there are, consequently, different thresholds for revision as the Oxford group has noted in a recent *Journal of Bone and Joint Surgery (Br)* annotation.⁶ A further systematic review comparing hip resurfacing with THR demonstrated that while resurfacing may give a better functional outcome, THR has better survivorship.⁷

It is important to note that, as with survivorship, using PROMs alone can cause problems. Logistically, questionnaires are more labour intensive and expensive to collect than survivorship data. Because of the subjective nature of PROMs, patient responses are influenced by contextual factors which are often not considered in the interpretation of the results. Many

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measures have marked floor and ceiling effects, as shown by a study from our unit which used the Oxford hip score to measure post-operative outcome in patients who had undergone THR and TKR.⁸ There is also a lack of consensus on which measures are best in which circumstances, which may reflect the need for different measures for different patients.

Survivorship is a hard outcome measure that is easier than PROMs to collect accurately. There is less controversy on how to measure survivorship, but thought still needs to be given as to how it is measured. Should we separate simple revisions (such as exchange of the liner) from complex revisions such as removal of all components? Furthermore, there is an argument that we should count failure of any part of the construct as failure, as one component may influence the early failure of the others. For example, the offset of the femoral component and the size of the head will influence the forces applied to the acetabular component. Survivorship of single implants in isolation, while ignoring survivorship of the entire construct, creates a false impression of success, as does reporting failure for only one reason, such as aseptic loosening. All failure needs to be reported accurately, as implant design and surgical technique contribute hugely to adverse events such as infection and dislocation.

Survivorship is an objective outcome measure that is easy, quick and relatively inexpensive to collect. However, with the improvements in surgical technique and implant design that have occurred since the advent of joint replacement, survivorship analysis is no longer an adequate measure of success when used in isolation. Survivorship is vitally important, but needs to be considered in context and used in conjunction with tools that measure patient-reported satisfaction, pain and disability. The importance of assessing outcome from the patient's perspective is highlighted by Darzi's report⁹ and the subsequent PROMs initiative. Despite this move by the government to highlight the priority of PROMs in the assessment of surgical outcomes, studies are still published that draw conclusions on the success

of an implant based solely on an analysis of its survival. Academic journals have an opportunity to facilitate and encourage the move towards routinely incorporating PROMs into any research study by defining failure of an implant as revision surgery or a poor patient-reported outcome.

We recommend that researchers strive to report survivorship of the entire construct as well as PROMs in order to present a more complete and accurate picture of outcome after joint replacement.

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