Clinician's Commentary on Gibson and Shields¹

Gibson and Shields' systematic review¹ investigates the effectiveness of combining aquatic and land-based rehabilitation programmes following hip and knee arthroplasty relative to land-only rehabilitation. In Australia, it is common practice for people who have undergone total knee arthroplasty (TKA) or total hip arthroplasty (THA) to participate in both aquatic and land-based rehabilitation in the acute-care setting; Gibson and Shields aimed to determine whether or not the extra cost of the pool is justified.

Three studies met their criteria: one randomized controlled trial (RCT),² one pilot RCT,³ and one controlled trial⁴ in acute-care and outpatient settings, looking at patients from 3 days to 6 weeks after surgery. The authors validated previous results in an orthopaedic systematic review⁵ and are able to suggest that adding aquatic therapy is associated with clinically significant gains in knee range of motion (ROM) and reduction of lower-extremity edema. However, the strength of the evidence is not sufficient to draw any conclusions about the economics of prescribing aquatic plus land-based therapy versus land-based therapy alone.

Gibson and Shields set out to review studies that replicate their own clinical practice,¹ but the lack of rehabilitation RCTs and the difficulty in blinding, bias, and recruitment severely limited the number of such studies. The authors acknowledge that they omitted one of the three studies (Stockton and Mengersen 2009⁴) from their meta-analysis because it did not use random allocation. Stockton and Mengersen's study is interesting in that it compared a twice-daily physiotherapy intervention to a once-daily physiotherapy intervention for people with THA as early as 1 day after surgery.⁴ The majority of participants were randomly allocated to the control or intervention groups, but a third group declined to participate in the random allocation because they preferred to attend hydrotherapy.⁴ Stockton and Mengersen reported no clinically significant between-group difference in either length of stay (LOS) or Iowa Level of Assistance Scale score at either day 3 or day 6, which suggests that neither the dosage of physiotherapy intervention nor patients' exercise bias affected the early discharge and function of these THA patients in the acute-care setting. The authors note that patients' age and their perception of expected LOS may have influenced the results. The Canadian best practice guidelines for arthroplasty indicate that health and patient expectations strongly influence delivery and outcomes of post-acute rehabilitation after TKA and THA.⁶

Gibson and Shields' meta-analysis reviewed two of the three studies included in their systematic review. The study by McAvoy and colleagues³ took place in an outpatient setting with a sample of 30 participants at least 2 weeks after TKA or THA. In this study, the intervention dosage was 60 minutes of land-based therapy twice a week, combined with 30 minutes of aquatic-based therapy twice a week, for 6 weeks; participants in the control group received 60 minutes of land-based therapy twice a week. The addition of aquatic therapy increased the time spent on active recovery, which in itself can improve outcomes. It is important to review study interventions in terms of *frequency, intensity, type, and time* (FITT) to get a true picture of efficacy. The second study in the meta-analysis, by Rahmann

and colleagues,² added supplementary physiotherapy (aquatic or land-based) to the standard land-based care pathway. The 35 participants began treatment on postoperative day 4–14 after TKA or THA and could receive extra ward physiotherapy, 1:1 aquatic therapy, or group aquatic therapy. Despite a mix of TKA and THA patients, physiotherapy dosage, and intervention timing, Gibson and Shields¹ are able to show that better outcomes (lower-extremity edema, activities of daily living, and ROM) were achieved using combined aquatic and land-based therapy than with land-based therapy alone.

Gibson and Shields compared land-based therapy only to aquatic plus land-based therapy following TKA and THA to mimic clinical practice and tease out the economics of these interventions, and specifically of aquatic therapy. Some more recent RCTs compare aquatic rehabilitation only to a combination of aquatic and land-based rehabilitation following arthroplasty. In Germany, Liebs and colleagues⁷ investigated early versus late aquatic therapy after TKA and THA, examining participants' function up to 24 months after surgery using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). With 465 participants (156 men, 309 women), they were able to conclude that early aquatic therapy had a moderate effect size following TKA (same as NSAIDs for OA) but was not supported following THA. What Liebs and colleagues' study suggests to me as a clinician is that we cannot look at both these surgeries in a single study and that postoperative restrictions for THA are better adhered to during land-based therapy.

Of the studies included in Gibson and Shields' systematic review, two^{2,4} investigated early aquatic intervention at postoperative day 4–14, although only one was included in the meta-analysis. There were no adverse events from early water immersion, a finding supported in a recent systematic review on early aquatic physiotherapy following orthopaedic surgery and the risk of wound-related adverse events.⁵ Other studies have compared strictly land-based interventions with strictly aquatic-based interventions, finding no difference in outcomes after either TKA or THA.⁸

I am a passionate believer in the benefits of aquatic therapy, and there is ample evidence of the positive physiologic effects of buoyancy, warmth, and hydrostatic pressure.⁹ The specific effect of progressive hydrostatic pressure when standing produces a surprising amount of compression at the knee (approximately 40 mmHg) when immersed in 0.6 m of water.⁹ Gibson and Shields identified the 10° gain in knee ROM as being due to the addition of aquatic therapy following arthroplasty, which they note is clinically significant and influences recovery of aspects of functional mobility such as transfers, gait, and stair climbing.

The economics of dual interventions are difficult to tease out because of the difficulty of measuring both short-term and long-term impacts on participants' future health care costs. Gibson and Shields identify the rising rate of arthroplasty and the need to reduce hospital LOS to control health care costs. However, the two acute-care studies^{2,4} found that the reduction in LOS for participants in the aquatic plus land-based therapy groups was not statistically significant (mean LOS was 8 days). In Canada, early aquatic intervention (at postoperative day 1) for

people undergoing TKA or THA is not practical; most acute-care hospitals closed their pools 20 years ago, and LOS is ≤ 5 days⁶ for both TKA and THA.

One of the three included studies was a pilot RCT in an outpatient setting,³ in which the intervention group participated in twice-weekly aquatic therapy plus twice-weekly land-based therapy. Outcomes (knee ROM and edema) were better for this group than for the control group, who participated in land-based therapy only. Canadian rehabilitation hospitals have been undergoing a renewal in terms of pools and pool programming, which has been mirrored in some community facilities as well. The economic reality of pools is that they cost money whether they are being used or sitting idle. Optimal use of the hydrodynamic properties and physiological effects of immersion, the potential for exercise with little fall impact, the reduction in joint loading, post-rehab community programming, and clients' exercise preferences are all good reasons to maximize the use of existing pools.

As surgical arthroplasty techniques evolve and the population parameters change (age, gender, lifestyle), the most up-to-date studies will best inform our practice. Canadian physiotherapists continue to work within care pathways, individualizing treatment, but we have other opportunities to explore and to help develop the community-based programming that follows rehabilitation. Gibson and Shields note that the cost utility of group and community-based resources need to be analyzed. Interestingly, in Australia and Europe, aquatic therapy is standard practice in acute care following TKA and THA.

There is enough evidence to warrant offering aquatic exercise as a component of postoperative rehabilitation following arthroplasty. Despite the heterogeneous populations, different intervention time points, and different applications of aquatic therapy (group and individual) in the studies they reviewed, Gibson and Shields are still able to report a significant reduction in edema and a significant increase in ROM of the affected limb with the combined intervention.

Gibson and Shields state that it is important to determine the cost-effectiveness of aquatic therapy in the TKA and THA population, suggesting that efficiency lies in using group classes and community resources. I agree, but would add that the value of aquatic physiotherapy interventions in the acute and rehab stages is significant, and that people who receive such interventions are more likely to participate in community post-rehab classes following discharge. Individual self-efficacy is an important factor in adopting a healthy, active lifestyle following arthroplasty; exposing people to aquatic therapy before discharge gives them more exercise choices and encourages a more active lifestyle following rehab.

Perhaps the next phase of research could develop an algorithm to consistently identify those patients who would most benefit from aquatic exercise. The physiotherapist has a role to play in bridging the client to community resources, and there are opportunities for therapists to help develop and design special-needs programming in community aquatic settings (e.g., YMCA, public pools). As for Gibson and Shields, I suspect that

their systematic review is just the beginning of a study in Australia that will add more to the body of research and inform best practices in rehabilitation following arthroplasty.

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