Supportive Care in Cancer (2022) 30:7061–7065
https://doi.org/10.1007/s00520-022-07212-1

EDITORIAL

Exercise for people with bone metastases: MASCC endorsed clinical recommendations developed by the International Bone Metastases Exercise Working Group

Nicolas H. Hart[1,2,3,4] · Dagmara M. Poprawski[5,6] · Fred Ashbury[7,8] · Margaret I. Fitch[9] · Raymond J. Chan[1,2] · Robert U. Newton[3,10] · Kristin L. Campbell[11]

Published online: 17 June 2022

Background

In 2022, the International Bone Metastases Exercise Working Group (IBMEWG) released the world's first clinical exercise recommendations as a guiding framework to support healthcare providers and exercise professionals in delivering safe exercise medicine to people with bone metastases [1]. As an international and interdisciplinary organisation dedicated to quality supportive care for all people affected by cancer, the Multinational Association for Supportive Care in Cancer (MASCC) endorses the IMBEWG produced clinical exercise recommendations, supported by MASCC Exercise Oncology and MASCC Survivorship Study Groups. Specifically, these recommendations provide an important resource for clinicians and people with bone metastases globally, which can be readily implemented in low-to-middle resource countries, thus supporting the World Health Organisations' Package of Interventions for Rehabilitation (Cancer) that is being released to all 190 WHO member health ministry's later this year, that were also co-developed by authors NHH, DMP, and MIF as representatives of MASCC.

International Bone Metastases Exercise Working Group

People with advanced cancer are an under-served subpopulation with characteristically high symptom burden and broad clinical needs [2–4] that can benefit from appropriately designed exercise medicine assessment and prescription [5]. However, people with bone metastases have unique safety parameters that require consideration to ensure the health benefits of exercise medicine can be realised without the development of skeletal complications, including lesion-, cancer-, treatment-, and patient-related factors. Recognising this challenge, and a lack of resources available to healthcare providers and exercise professionals, the IBMEWG — consisting of 23 experts from across the world (i.e., Australia, Canada, Europe, UK, and USA) and clinical disciplines (i.e., exercise physiologists, physiotherapists, kinesiologists, physiatrists, medical oncologists, and radiation oncologists) — was established [1].

✉ Nicolas H. Hart
nicolas.hart@flinders.edu.au

1 Caring Futures Institute, College of Nursing and Health Sciences, Flinders University, Adelaide, SA, Australia

2 Cancer and Palliative Care Outcomes Centre, School of Nursing, Queensland University of Technology, Brisbane, QLD, Australia

3 Exercise Medicine Research Institute, School of Medical and Health Sciences, Edith Cowan University, Perth, WA, Australia

4 Institute for Health Research, The University of Notre Dame Australia, Perth, WA, Australia

5 Department of Oncology, King Faisal Specialist Hospital & Research Centre, Riyadh, Kingdom of Saudi Arabia

6 College of Medicine and Public Health, Flinders University, Adelaide, SA, Australia

7 Dalla Lana School of Public Health, University of Toronto, Toronto, Canada

8 Department of Oncology, University of Calgary, Calgary, Canada

9 Bloomberg Faculty of Nursing, University of Toronto, Toronto, Canada

10 School of Human Movement and Nutrition Sciences, The University of Queensland, Brisbane, QLD, Australia

11 Department of Physical Therapy, University of British Columbia, Vancouver, British Columbia, Canada

Developing the IBMEWG exercise recommendations

Ensuring clinical credibility, integrity, and practical utility in providing exercise to people with advanced cancer and bone metastases, the IMBEWG clinical exercise recommendations were developed using a coordinated, iterative, and consultative multidisciplinary approach that included input from consumers (people with bone metastases) and stakeholders (healthcare providers and other exercise professionals) through-out (Fig. 1).

Following an in-person planning session at the American College of Sports Medicine (ACSM) annual meeting in 2018, the IBMEWG first explored the knowledge, beliefs, and attitudes of Canadian oncologic health care providers through a web-based survey [6, 7], highlighting their agreement that physical activity is important and safe for people with bone metastases, while noting they required more information before being able to recommend physical activity to these people with advanced cancer. Second, the IBMEWG conducted a systematic review [8] to synthesise evidence of prescribed exercise for people with bone metastases, identifying 17 unique trials involving 645 people with sclerotic or osteolytic bone metastases; demonstrating various modes of aerobic, resistance, or sport-based exercise were safe and feasible, while concluding that future larger randomised controlled trials are needed to facilitate sufficient statistical power that will underpin intervention efficacy for this patient population. Third, a modified Delphi consensus process [9] was conducted to incorporate clinical expertise and experience regarding exercise screening for people with bone metastases from 73 physicians, clinical exercise physiologists, and physical therapists worldwide.

Integrating the collective research and clinical evidence derived from the survey, systematic review, and Delphi process, in May of 2019, the IBMEWG convened an in-person international roundtable in Canada (Victoria, British Columbia). This roundtable discussed and deliberated to establish a formal set of clinical exercise recommendations for healthcare providers and exercise professionals over 3 days, culminating in the drafted development of one overarching recommendation, as well as five key recommendations [1]. However, prior to finalising these recommendations, stakeholder engagement was purposefully sought through an in-person focus group with a round of input from people with bone metastases ($n = 3$; living with bone metastases more than 1 year; and prior experience with exercise), followed by a penultimate independent review from clinician peers ($n = 5$; exercise or health professionals; experienced managing people with bone metastases) that led to the finalisation of the official recommendations, now endorsed by MASCC and several other cancer or exercise associations worldwide.

Summary of IBMEWG exercise recommendations

It is appreciated that people with bone metastases should be supported by their health care providers and exercise professionals to engage in regular exercise. In particular, people with advanced and metastatic cancer stand to significantly benefit from exercise as medicine across various settings, to prepare for, better tolerate, and recover from their cancer treatments [5], and may improve cancer-specific outcomes inclusive of changes to disease biology [10–12], and a potential to prolong survival [13] with studies underway to explore and definitively address these questions.

Overarching and specific recommendations emerging from contributing evidence described earlier, and the rigorous discussions among the IBMEWG members were established for pre-exercise screening, testing, prescription, and

Fig. 1 Structured and graded development of the IBMEWG exercise recommendations

monitoring of exercise response. Identification of people at potentially higher risk of exercise-related skeletal complication must incorporate the complex interplay of lesion-related, person-related, cancer-, and treatment-related factors (Fig. 2). Exercise assessment and prescription requires consideration of the location and presentation of bone lesion(s) and should be prepared and delivered by appropriately qualified exercise professionals with cancer education and exercise oncology prescription experience. Emphasis on postural alignment, controlled movement, and proper technique is essential for this population, with clinicians required to adopt a risk-based approach to exercise delivery.

Overarching recommendation: Regular exercise has clear potential to maintain or improve physical function, and health-related quality of life in people with bone metastases (sclerotic and osteolytic). The perceived risk of skeletal complication should always be weighed against the potential health benefits.

Recommendation #1: Before exercise testing or training, perform a risk assessment to inform the likelihood of a skeletal complication from exercise (Fig. 2).

Recommendation #2: Consultation with the medical team is strongly encouraged before an exercise professional provides structured exercise to a person with bone metastases to obtain key medical information and establish bidirectional communication for initial assessment and exercise training throughout care.

Recommendation #3: Exercise professionals best suited to prescribe exercise to people with bone metastases are physical therapists and clinical exercise physiologists (or equivalent), who have additional cancer exercise training and appropriate experience in working with people with a cancer diagnosis.

Recommendation #4: Professional judgment should be used to consider if exercise testing at baseline and follow-up is necessary by weighing the risks and benefits of including the test or if the testing protocols may need to be modified.

Recommendation #5: Exercise prescriptions should follow International Exercise Guidelines for Cancer Survivors developed by ACSM and ESSA [14, 15], with greater emphasis on postural alignment, controlled movement, and proper technique, as well as consideration given to the location and presentation of the bone lesion(s). Formal monitoring of exercise response and adjustment of exercise prescription should be ongoing.

Future directions

Clinical recommendations provided by the IBMEWG are conservative with acknowledgement that the field of exercise for people with bone metastases is at its relative infancy. However, the recommendations provide an important framework and helpful starting point for exercise professionals

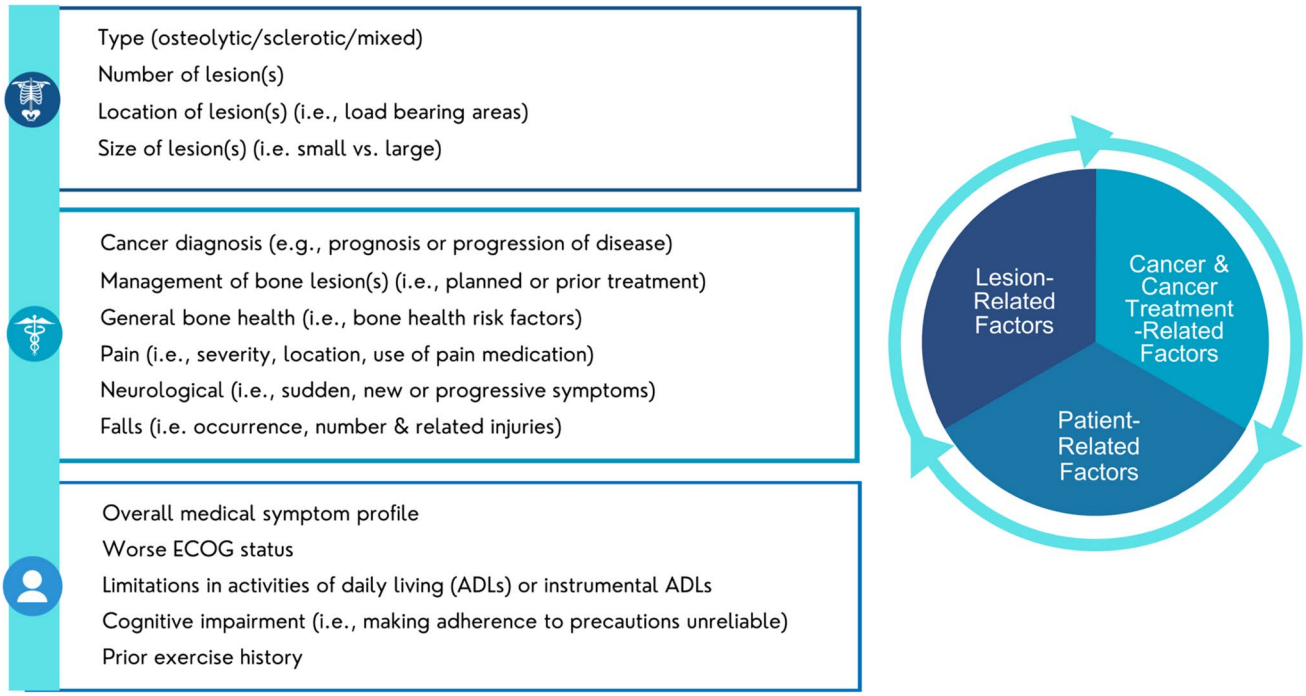

Fig. 2 Risk assessment canvassing lesion-related, patient-related, and cancer- and treatment-related factors for consideration prior to preparing an exercise plan

and members of the health care team to improve integration of physical activity and exercise into the supportive care of people with bone metastases. The recommendations provided by the IBMEWG will continue to evolve as research and clinical knowledge grows. MASCC's Exercise Oncology Study Group, supported by the MASCC Survivorship Study Group, stands ready to advance these efforts through our international leadership role. To that end, herein, we provide six key suggestions to consider as a priority for future research in this field:

1. Improved trial reporting of metastatic lesion details (i.e., location, number, type, size, and stability), screening processes (i.e., decisions pertaining to inclusion or exclusion, or exercise programming choices), and adverse events (i.e., grading of event, number, and attributions for disease- and exercise-related).
2. Focus on quantifying and addressing patient and stakeholder perspectives (i.e., the healthcare professionals, exercise professionals, informal caregivers, and insurance companies) to overcome rational and irrational concerns or fears around exercise for people with bone metastases (i.e., promote facilitators, remove barriers).
3. Explore ways to validate bone metastases-induced skeletal stability tools (i.e., spinal instability neoplastic score, Taneichi score, and Mirels score) for use in the decision-making of exercise testing or training suitability and safety.
4. Develop and validate potential risk stratification matrices and scoring tool(s) derived from cumulative lesion-, patient-, cancer-, and cancer-treatment-specific factors that may support exercise professionals through the provision of a standardised risk–based approach to exercise testing and training for people with bone metastases.
5. Examine principles pertaining to exercise programming for people with stable and unstable lesions or painful lesions; inclusive of understanding minimum effective doses; dose-response relations of exercise modalities; influence of various modalities, intensities, and volumes; and the ability to maintain safety and fidelity through virtual engagement via digital health solutions inclusive of virtual medicine and telemedicine, to better accommodate rural and remote cancer survivors.
6. Focus on health service and implementation science research to enhance and examine the reach, effectiveness, adoption, implementation, and maintenance (RE-AIM) of these exercise recommendations into clinical practice; and more broadly, to explore ways to enhance access to routine exercise services within standard cancer care for people with bone metastases in disparate hospitals and health services worldwide. This is particularly important for low-to-middle resource countries, and places in high resource countries which service large rural and remote catchment areas facing their own resource challenges.

Endorsement

MASCC (Multinational Association for Supportive Care in Cancer), through its MASCC Exercise Oncology and MASCC Survivorship Study Groups, officially endorses the externally produced *exercise recommendations for people with bone metastases* developed and released by the IBMEWG (International Bone Metastases Exercise Working Group).

Declarations

Conflict of interest NHH is Chair of MASCC Exercise Oncology and a MASCC Langbaum Survivorship Fellow. DMP is Vice-Chair of MASCC Exercise Oncology. RJC and MIF are the Chair and Vice-Chair of MASCC Survivorship; and RJC is also a MASCC Board Member. FA is a MASCC Ex-Officio Member and Chair of MASCC Guidelines Committee. NHH, RUN, and KLC are IBMEWG members. FA is Editor-in-Chief of *Supportive Care in Cancer*. MIF is an Editorial Consultant of *Supportive Care in Cancer*.

References

1. Campbell KL, Cormie P, Weller S, Alibhai SMH, Bolam KA, Campbell A, Cheville AL, Dalzell M, Hart NH, Higano CS, Lane K, Mansfield S, McNeely ML, Newton RU, Quist M, Rauw J, Rosenberger F, Santa Mina D, Schmitz K et al (2022) Exercise recommendations for people with bone metastases: expert consensus for healthcare providers and clinical exercise professionals. JCO Oncol Pract:OP2100454. https://doi.org/10.1200/OP.21.00454
2. Mollica MA, Smith AW, Tonorezos E, Castro K, Filipski KK, Guida J, Perna F, Green P, Jacobsen PB, Mariotto A, Tesauro G, Gallicchio L (2022) Survivorship for individuals living with advanced and metastatic cancers: National Cancer Institute meeting report. J Natl Cancer Inst. 114(4):489–495. https://doi.org/10.1093/jnci/djab223
3. Smith AL, Hart NH, Jefford M, Chan RJ (2022) Survivorship research for people with metastatic or advanced cancer: A a time for action. Asia-Pacific J Oncol Nurs. https://doi.org/10.1016/j.apjon.2022.02.001
4. Hart NH, Crawford-Williams F, Crichton M, Yee J, Smith TJ, Koczwara B, Fitch MI, Crawford GB, Mukhopadhyay S, Mahony J, Cheah C, Townsend J, Cook O, Agar MR, Chan RJ (2022) Unmet care needs of people with advanced cancer and their caregivers: a systematic scoping review. Crit Rev Oncol Hematol. https://doi.org/10.1016/j.critrevonc.2022.103728
5. Hart NH, Galvao DA, Newton RU (2017) Exercise medicine for advanced prostate cancer. Curr Opin Supp Palliat Care. Hart NH, Galvao DA, Newton RU. Exercise medicine for advanced prostate cancer. 11(3):247-257. https://doi.org/10.1097/SPC.0000000000000276
6. Adams J, Rauw J, Weller S, Campbell KL, Pollock P, Goulart J (2021) Physical activity recommendations for cancer survivors living with bony metastases: views of oncologic healthcare

providers. J Cancer Surviv. 15(3):414–417. https://doi.org/10.1007/s11764-021-00999-8
7. Joseph R, Hart NH, Bradford N, Agbejule OA, Koczwara B, Chan A, Wallen MP, Chan RJ (2022) Diet and exercise advice and referrals for cancer survivors: an integrative review of medical and nursing perspectives. Support Care Cancer. https://doi.org/10.1007/s00520-022-07152-w
8. Weller S, Hart NH, Bolam KA, Mansfield S, Santa Mina D, Winters-Stone KM, Campbell A, Rosenberger F, Wiskemann J, Quist M, Cormie P, Goulart J, Campbell KL (2021) Exercise for individuals with bone metastases: A a systematic review. Crit Rev Oncol Hematol. 166:103433. https://doi.org/10.1016/j.critrevonc.2021.103433
9. Campbell KL, Weller S, Cormie P, Lane KN, Rauw J, Goulart J (2020) Enhancing safety of exercise for individuals with bone metastases: screening recommendations developed through Delphi consensus process. J Clin Oncol. 38(15 Suppl):e24042. https://doi.org/10.1200/JCO.2020.38.15_suppl.e24042
10. Hart NH, Newton RU, Spry NA, Taaffe DR, Chambers SK, Feeney KT, Joseph DJ, Redfern AD, Ferguson T, Galvão DA (2017) Can exercise suppress tumour growth in advanced prostate cancer patients with sclerotic bone metastases? A randomised, controlled study protocol examining feasibility, safety and efficacy. BMJ Open. 7(3):e014458. https://doi.org/10.1136/bmjopen-2016-014458
11. Hart NH, Galvão DA, Saunders C, Taaffe DR, Feeney K, Spry N, Tsoi D, Martin H, Chee R, Clay T, Redfern A, Newton RU (2018) Mechanical suppression of osteolytic bone metastases in advanced breast cancer patients: a randomised controlled study protocol evaluating safety, feasibility, and preliminary efficacy of exercise as a targeted medicine. Trials. 19(1):695. https://doi.org/10.1186/s13063-018-3091-8
12. Jin-Soo K, Taaffe DR, Galvao DA, Hart NH, Gray E, Ryan CJ, Kenfield SA, Saad F, Newton RU (2022) Exercise in advanced prostate cancer elevates myokine levels and suppresses in-vitro cell growth. Prost Can Prost Dis. 25(1):86–92. https://doi.org/10.1038/s41391-022-00504-x
13. Newton RU, Kenfield SA, Hart NH, Chan JM, Courneya KS, Catto J, Finn SP, Greenwood R, Hughes DC, Mucci LA, Plymate SR, Praet SFE, Guinan EM, Van Blarigan EL, Casey O, Buzza M, Gledhill S, Zhang L, Galvão DA et al (2018) Intense exercise for survival among men with metastatic castrate-resistant prostate cancer (INTERVAL-GAP4): A a multicentre, randomised, controlled phase III study protocol. BMJ Open. 8(5):e022899. https://doi.org/10.1136/bmjopen-2018-022899
14. Campbell KL, Winters-Stone K, Wiskemann J, May AM, Schwartz AL, Courneya KS, Zucker D, Matthews C, Ligibel J, Gerber L, Morris S, Patel A, Hue T, Perna F, Schmitz K (2019) Exercise guidelines for cancer survivors: consensus statement from international multidisciplinary roundtable. Med Sci Sports Exerc. 51(11):2375. https://doi.org/10.1249/MSS.0000000000002116
15. Hayes SC, Newton RU, Spence RR, Galvão DA (2019) The Exercise and Sports Science Australia position statement: exercise medicine in cancer management. J Sci Med Sport. 22(11):1175–1199. https://doi.org/10.1016/j.jsams.2019.05.003