Perspectives on Sharing Models and Related Resources in Computational Biomechanics Research

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This presentation will summarize our recently published activity to collate and synthesize opinions on model sharing and reproducibility in computational biomechanics. The efforts emerged from discussions at the IMAG/MSM Biomechanics and Model and Data Sharing Working Groups. It was influenced by the work of the IMAG/MSM Committee on Credible Practice of Modeling and Simulation in Healthcare and enabled by the IEEE EMBS Computational Biology and the Physiome Technical Committee.

Article Abstract. The role of computational modeling for biomechanics research and related clinical care will be increasingly prominent. The biomechanics community has been developing computational models routinely for exploration of the mechanics and mechanobiology of diverse biological structures. As a result, a large array of models, data, and discipline-specific simulation software has emerged to support endeavors in computational biomechanics. Sharing computational models and related data and simulation software has first become a utilitarian interest and now it is a necessity. Exchange of models, in support of knowledge exchange provided by scholarly publishing, has important implications. Specifically, model sharing can facilitate assessment of reproducibility in computational biomechanics, and can provide an opportunity for repurposing and reuse, and a venue for medical training. The community's desire to investigate biological and biomechanical phenomena crossing multiple systems, scales, and physical domains, also motivates sharing of modeling resources as blending of models developed by domain experts will be a required step for comprehensive simulation studies as well as the enhancement of their rigor and reproducibility. The goal of this article is to understand current perspectives in the biomechanics community for the sharing of computational models and related resources. Opinions on opportunities, challenges, and pathways to model sharing, particularly as part of the scholarly publishing workflow, were sought. A group of journal editors and a handful of investigators active in computational biomechanics were approached to collect short opinion pieces as part of a larger effort of the IEEE EMBS Computational Biology and the Physiome Technical Committee to address model reproducibility through publications. A synthesis of these opinion pieces indicates that the community recognizes the necessity and usefulness of model sharing. There is a strong will to facilitate model sharing and there are corresponding initiatives by the scientific journals. Outside the publishing enterprise, infrastructure to facilitate model sharing in biomechanics exists and simulation software developers are interested in accommodating the community's needs for sharing of modeling resources. Encouragement for the use of standardized markups, concerns related to quality assurance, acknowledgement of increased burden, and importance of stewardship of resources are noted. In the short-term, it is advisable that the community builds upon recent strategies and experiments with new pathways for continued demonstration of model sharing, its promotion, and its utility. Nonetheless, the need for a long term strategy to unify approaches in sharing computational models and related resources is acknowledged. Development of a sustainable platform supported by a culture of open model sharing will likely evolve through continued and inclusive discussions bringing all stakeholders at the table, e.g., by possibly establishing a consortium.