

Recommendations and Implementation Strategies for the Assessment and Reporting of Dancer Capacities, Risk Factors, and Injuries: Steps toward Consensus

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INTRODUCTION

In 2004 IADMS launched a multi-year consensus-building project at its Annual Meeting in San Francisco, California, USA. The aim of the project was to undertake a review of the literature and of current practices related to the assessment and reporting of dancer capacities, risk factors, and injuries, and to develop evidence-based recommendations for standardized testing and reporting methods in these areas of concern. This project became the Standard Measures Consensus Initiative (SMCI). The primary objective of the SMCI was to establish a set of recommendations to:

1. Identify a uniform methodology for tests and measures used to assess dancer capacities and extrinsic risk factors for injury;
2. Establish common protocols for the reporting of injuries; and
3. Assist the dance medicine community in applying these recommendations through the use of all available and applicable technologies.

The ultimate goal of these recommendations was conceived to be the standardization of measurement of intrinsic and extrinsic risks factors and of injury reporting for researchers in dance medicine and science, to allow for more robust comparison of results across research studies. Such standardization should additionally enhance the ability of the dance medicine community to identify the most meaningful ways to reduce risk and prevent injury in all dance genres.

ACTIVITIES OF THE SMCI

Toward achieving these goals the SMCI:

1. Reviewed existing literature to identify generalized models of health, injury prevention, and the causative factors of injury;

2. Reviewed existing literature and conducted surveys to determine how the dance medicine community was currently identifying, quantifying, and describing the occurrence of injury/illness and the mechanisms related to injury;
3. Compared and contrasted practices currently used by the dance medicine community with those models described as best practices in the literature;
4. Developed recommendations for best definition and measurement practices within the dance medicine and science community;
5. Developed recommendations for a model data management system;
6. Presented the following platform reports to the IADMS community at its annual meeting, inviting audience feedback and providing roundtable discussions:
 - a. Statement of need: Launch of SMCI. San Francisco, California, USA 2004
 - b. Standardized measurement of function. Stockholm, Sweden 2005
 - c. Screening: merits and limits (what and why to measure; overarching aim to reduce injury risks; review of field survey results). West Palm Beach, Florida, USA 2006
 - d. Injury reporting: epidemiologic content; review of field survey results; expert panel discussion. Canberra, Australia 2007
 - e. World Health Organization-based biopsychosocial predictive modeling. Cleveland, Ohio, USA 2008
 - f. Summary of SMCI work: whole context sequence of prevention model. The Hague, The Netherlands 2009
 - g. Best practices for collaborative research and secure data management of personal health information. Washington, DC, USA 2011

The following Executive Summary provides a brief overview of the six key recommendations made by the SMCI. A detailed analysis of each recommendation is available in the Technical Report.¹ The recommendations are based on the premise that having an understanding of the cause of injury is central to advancing knowledge and practice, particularly with regard to prediction and prevention.² Central to this work is the understanding that dance injuries result from a complex interplay between human (intrinsic), environmental (extrinsic), and situational factors, and that these factors must be measured in a robust and standardized fashion if they are to be reduced. Ultimately, the six recommendations derived from the SMCI's field survey reflect a sample of the dance community's injury surveillance and screening behaviors and a comparison of those behaviors with published information about best practices from the health sciences literature. The SMCI recognizes that there may be a learning curve associated with implementing its recommendations in the field. To that end, several scenarios have been laid out for consideration in the Implementation Strategies section of this Executive Summary.

RECOMMENDATIONS OF THE SMCI:

1. ***Injury Surveillance:*** A dance injury surveillance system should be mandatory, utilize licensed healthcare professionals trained to diagnose injuries (Recommendation 2), and employ a standardized protocol for capturing injury-per-exposure data for all dancers within a specified group (Recommendation 3).
2. ***Defining Injury:*** The term "injury" refers to anatomic tissue-level impairment as diagnosed by a licensed health care practitioner that results in full time loss from activity for one or more days beyond the day of onset. "Activity" in this definition means participation in a class, rehearsal, or performance (see "exposure," Recommendation 3). For those events that do not rise to the level

of a reportable injury event within the surveillance system the term "musculoskeletal complaint" should apply.

3. **Defining Exposure:** Each participation in a class, rehearsal, or performance in which the dancer was exposed to the possibility of a dance injury constitutes one exposure. Exposure is used in the calculation of injury rate (how often per opportunity).
4. **Dance-Specific Screening:** Given the current lack of a standardized approach to screening in the dance medicine and science community, the SMCI recommends that the Pre-participation Physical Evaluation (PPE) form be used as the foundation for dance-specific screening. The PPE is a universal screening form used for athletes and adopted by consensus and used by major medical associations for sports around the world over the past 30+ years. Additional tests and measures that have special relevance to dancers may be added as they are developed and validated.
5. **Risk Reduction Strategies:** The development of risk reduction strategies should embrace the World Health Organization's biopsychosocial model of functioning, which recognizes that the risk of injury is due to the interaction of causative factors over time. Successful predictive models can only be built once there is broad acceptance of standards for reporting.
6. **Collaborative Data Management:** Collaborative data management for the dance medicine and science community is realistic and encouraged. Under the best of circumstances, it should be overseen by a parent organization that is responsible for determining policy for secure and legally compliant practices of data collection, storage, and sharing. An Independent Data Manager should be responsible for maintaining quality control, while data collection should involve: data stewards, who recommend policy; data supervisors, who ensure adequate resources and staff compliance with data collection standards; and data collectors, who are trained to apply data collection standards consistently.

IMPLEMENTATION STRATEGIES. At this point in time implementation strategies are applicable only to recommendations 1 through 4. Risk reduction strategies can only be developed once the dance medicine community has had an opportunity to implement recommendations 1 to 4, analyze the results, and begin testing potential solutions.

Recommendation 6 is essential to providing the necessary infrastructure to collect and analyze data sets that are large enough and consistent enough to produce the power needed for valid statistical analysis. However, the creation of an Independent Data Management entity requires a coordinated effort from the dance medicine community, and warrants on-going discussion among interested parties. In this Executive Summary, we will focus our discussion of strategies on the first four SMCI recommendations.

INJURY SURVEILLANCE USING STANDARDIZED DEFINITIONS OF INJURY AND

EXPOSURE. The first three SMCI recommendations represent best practices for injury surveillance within the dance community. Figure 1 below summarizes the basic steps required to determine injury rate in a robust dance injury surveillance system, wherein a balance (or trade-off) is struck between the reliability of data gathering across multiple observers and the degree of precision with which those data (i.e., the type of injury involved) are described. In short, we achieve more agreement (better reliability) among observers when we make the injury description more obvious and simple (less precise), such that everyone is capable of recognizing the same threshold of injury. It is important to recognize that the level of rigor recommended in Figure 1 is not always possible under all dance circumstances. Espousing a best practices standard does not preclude others from collecting injury data to the best of their ability.^{3,4} Those wishing to collect injury data that is less, or more, precise than that which is recommended in these guidelines are free to do so, but they will need to explain their

measurement methodology and acknowledge the limitations of their data with respect to the standards outlined here.

Injury Surveillance			
<i>Least Rigor</i>		<i>Most Rigor</i>	
1. Establish Level of Participation			
Voluntary		Mandatory	
2. Define Injury			
Self-reported musculoskeletal complaint/no time off	Self-reported musculoskeletal complaint/modified participation, but no time off	Musculoskeletal injury diagnosed by a licensed healthcare practitioner AND resulting in at least 1 missed day of full dance activities (beyond day of injury itself)	
3. Identify Exposure			
Per annual contracted work hours	Per dance exposure	Per time exposure	Per element exposure
4. Identify Size of Cohort (number of dancers in defined group exposed to risk and under surveillance)			
5. Calculate Injury Rate: (# of Injuries/# of exposures for all dancers in cohort)*1000 = Injuries per 1000 DE (dance exposures)			

APPLICATION. Below are two scenarios of how injury surveillance might be implemented in real time.

SCENARIO 1 (BEST PRACTICE SCENARIO). A professional dance company contracts with local medical practitioners to provide structured care for their dancers during a 36-week season. There are 30 dancers in the company: 6 principals, 8 soloists, and 16 corps members. It is verified that every dancer takes company class five days per week. Further, it is verified that the principals have one rehearsal per day on Monday, Wednesday, and Friday, and two rehearsals per day on Tuesday and Thursday, and that the soloists and corps have two rehearsals per day Monday through Thursday and one rehearsal on Friday. The company mounts two Fall and three Spring performance series, of six performances each. The principals and soloists alternate casts, the corps dances all shows. The company also does 36 Nutcracker shows in November and December. Each principal performs in 12 shows; soloists and corps members perform five shows per week and have one show off.

During the season 241 musculoskeletal complaints were treated, but were not associated with any time lost from a dance class, rehearsal, or performance. There were 49 confirmed injuries that received a diagnosis from one of the company's healthcare providers. Each of these 49 injuries produced at least one full day of missed dance activities (beyond the day of injury onset itself).

SCENARIO 1 - DETERMINING INJURY RATE

1. Number of Injuries = 49
2. Number of exposures (totals from below) = 16170
 - a. One dance class per day x 5 days x 36 weeks = 180 x 30 dancers = 5400
 - b. Principal rehearsals : 7 per week x 36 weeks = 252 x 6 dancers=1512
 - c. Soloist/Corps rehearsals: 9 per week x 36 weeks = 324 x 24 dancers=7776
 - d. Principal performances: 6 in Fall + 9 in Spring + 12 nutcrackers = 27 x 6 dancers=162
 - e. Soloist performances: 6 in Fall + 9 in Spring + 30 nutcrackers = 45 x 8 dancers=360
 - f. Corps performances: 12 in Fall + 18 in Spring + 30 nutcrackers = 60 x 16 dancers=960
3. Injury rate:
 - a. $(49/16170)*1000 = 3.0$ injuries per 1000 Dance Exposures (DE)

- b. Compare to dance injury rates per 1000 DE that are reported in current dance medicine literature: 0.4 to 2.6 injuries per 1000 DE⁵⁻¹⁴

SCENARIO 2 (WITH LIMITATIONS). A semi-professional dance company works with a volunteer therapist who comes in 1 x per week to treat dancers pro-bono. There are 12 dancers in this ensemble company; they have a 26 week part-time contract (six hours of rehearsal per week). Dancers are required to take company class 2 x per week, and encouraged to take classes the remainder of the week. The company mounts three Fall and three Spring performance series, of six performances each. Generally speaking, all dancers perform at each show, but roles are assigned on a best-fit basis. During the season 75 musculoskeletal complaints were treated by the therapist, but were not associated with any time lost from a dance class, rehearsal, or performance. There were seven confirmed injuries that received a diagnosis from the therapist, and two injuries that were diagnosed by the dancers' primary care physicians and reported back to the artistic director, who reported the injuries to the therapist. With each of the nine injuries the dancers missed at least one full day of dance activities (beyond the day of injury onset itself).

SCENARIO 2 – DETERMINING INJURY RATE

1. Number of Injuries = 9
2. Number of exposures (totals from below) = 2928
 - a. 2 confirmed dance classes per week x 26 weeks = 52 x 12 dancers = 624
 - b. 6 hours of rehearsals per week x 26 weeks = 156 x 12 dancers = 1872
 - c. Performances: 18 in Fall + 18 in Spring = 36 x 12 dancers = 432
3. Injury rate:
 - a. $(9/2928) \times 1000 = 3.07$ injuries per 1000 Dance Exposures (DE)
 - b. Limitations: voluntary reporting; insufficient exposure verification
 - c. Compare to current benchmark for dance injuries: 0.4 to 2.6 injuries per 1000 DE⁵⁻¹⁴

DANCE-SPECIFIC SCREENING. The SMCI recognizes that there are several substantial and ongoing efforts to discern the utility of additional tests and measures that may necessitate revision of this recommendation in the future. There currently is a lack of one broadly accepted, standardized approach to screening in the dance medicine and science community. While individual researchers, health care providers, and dance instructors may wish to collect additional information during dance screenings, with respect to reduction of risk and rate of injury, the literature clearly supports use of the Pre-Participation Physical Evaluation (PPE) Form as the basis of any pre-season sports (including dance) screening.

APPLICATION. A copy of the standard PPE Form can be found in [Appendix A](#). The first page of the PPE is a self-administered questionnaire that the dancer and/or parent fills out. The second page is also a self-administered questionnaire for dancers with special needs. The third and fourth pages should be completed by a physician in conjunction with a physical examination. While the PPE may not seem to have much dance-specific relevance, it consists of absolute baseline criteria that should be included in all dance screenings. There are many additional and varying recommendations for dance-specific tests and measures that can be included as well at the discretion of the testing institution. While most of the PPE cannot be filled out by non-physicians, it does have the advantage of giving the dance medicine community an opportunity to develop important alliances within the traditional medical framework that will likely produce additional benefits in the future.

SCENARIO 1: Invite a local primary care physician (PCP) who participates in the dancers' insurance plan to conduct the physician portion of a post-hire, pre-season dance screening PPE in a professional company. This ensures that the history for each dancer is medically reviewed, and makes valuable connections between the dancers and a PCP within their network.

SCENARIO 2: Coordinate with local physicians to form a performing arts medicine alliance that performs PPE's in exchange for exposure to the community at large as a sponsor of local performing artists.

Many more collaborative scenarios exist. Those suggested above simply illustrate two possibilities and seed the dialogue for cultivating other arrangements.

CONCLUSIONS

Given the human and economic burdens of musculoskeletal injury on dancers and dance organizations, it is imperative to develop an evidence-based approach to the prevention and reduction of dance injuries. Current practices make it difficult to achieve a true understanding of dance-related injuries, or to develop meaningful risk reduction strategies. At present, the dance medicine and science community cannot adequately compare injury incidence estimates among dancers because: 1) investigators have used very different methods for collecting injury data, without a standard definition of injury and with no measurement of, or even broadly defined variables in the definition of, exposure; and 2) investigators have often not reported their methods in sufficient detail to be reproducible.

The SMCI recommends that the dance medicine and science community create and fund a Foundation for Dance Medicine to act as an independent grant making and data management organization facilitating broad scale injury surveillance and predictive modeling. Such an organization should reduce redundant and conflicting efforts to achieve these goals. Other professional organizations, such as the Foundation for Physical Therapy, have undertaken similar endeavors and realized important benefits in terms of stabilizing standards and funding research.

This Executive Summary presents the recommendations of the SMCI committee that are aimed at improving the ability of the dance medicine and science community to reduce the risk of injuries to dancers based on valid scientific information. These recommendations result from a review of the literature and current best practices within the dance and sports communities. Please see the full Technical Report for the background and rationale of each of the SMCI recommendations.

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APPENDIX A

[Pre-participation Physical Evaluation Form](#). Permission granted by the American Academy of Family Physicians. Permission Request #2291.

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