EDUCATION: Tutorial Template

This type of abstract describes new tools, models, techniques, methodologies pertinent to civilian and military aerospace medicine and human performance.

Please retain the headings in **BOLD** and replace the *blue text in italics* with your submission.

INTRODUCTION: *<This section summarizes what will be covered, e.g., list of topics or syllabus.>*

TOPIC: *<Description of new technology, procedure, methodology.>*

APPLICATION: *<This section details how the new material will be implemented and how broadly it applies to aerospace medicine and human performance.>*

RESOURCES: *<This is an optional section to provide citations where additional information can be found.>*

Example (ASEM, 84(4):296, 2013):

WHAT YOU NEED TO KNOW ABOUT INJURY RISK MODELING

INTRODUCTION: In order to accurately apply injury risk curves in an experimental and modeling program to develop safety design criteria, it is critical to understand how these functions are developed, and how to critically evaluate published injury risk functions.

TOPIC: Statistics are fundamental. For example, knowing the weight of one person in the US does not help us design for everyone else. Even knowledge of the statistical means has limited value. Imagine the consequences of designing a bridge for a mean load of 10,000 lb without knowing that peak loads may exceed 50,000 lb. So, detailed statistical knowledge, particularly in characterizing injury risk, is essential. These assessments often combine disparate sources of data, perhaps experimental data or computational model outputs. Together, these components help establish the physical responses to a range of applied conditions, and these may be used to develop injury risk assessments across a wide range of possible exposures.

In injury risk modeling, input variables, such as force, load, and windspeed, must be correlated with injury. These injuries may be binary (injured/uninjured), ordinal (mild, moderate) or continuous (percentage loss). There are several ways to develop the injury risk curve; the choice has a strong effect on the usefulness of the risk function. One long-used method of generating these curves is a logistic regression. However, severe shortcomings in representing and fitting data cause this method to be unrealistic under many conditions. A better alternative is survival analysis. This method has a major advantage in its ability to account for the inclusion of non-injury data and overkill scenarios. Further information can be incorporated using Bayesian survival analysis, which may include prior information, including injuries or even informed heuristic assessments.

APPLICATION: The need for injury risk functions should be considered during the planning stages of a program to assess injury risk. The predictive power can be improved using a well-planned exposure range and by specifically collecting measurements to improve the quality of the data in the model. These techniques are broadly applicable in many medical research situations.

RESOURCES: Schmidt AL, Paskoff GR, Shender BS, Bass CR. Risk of Lumbar Spine Injury from Cyclic Axial Loading. Spine. 37:E1614-21, 2012.