Overlapping Conditions in IMPACT

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Introduction

The IMPACT 1.0 model assumes independence of 119 different medical conditions. That is, it is assumed that one medical event maps to a single medical condition. However, it is often the case that a single medical event may lead to several different concurrent conditions (e.g., a single accident resulting in multiple fractures, chest/abdominal trauma, and sepsis). There is a significant overlap between many of the conditions in ICL 1.0. For example, depression and anxiety are two separate conditions but often co-exist. This overlap may lead to an overestimation in the incidence calculation. In future iterations of the model, we plan to address progression of medical conditions

Methods

There are two possible methods to approach progression of a medical condition. The first is to take any medical condition in ICL, calculate its incidence and determine its outcomes no matter what sequelae occur. For example, calculate the incidence of prostatitis and determine its metrics (e.g., loss of crew life, risk of medical evacuation or task time affected) no matter what the sequelae might be (sepsis, hydronephrosis, renal failure, etc.). The second approach is to take any medical condition in the ICL and calculate the outcomes based on transitions to any other condition. For example, calculate the incidence of nephrolithiasis and determine the incidence of each possible transition (e.g., hydronephrosis, renal failure, UTI, pyelonephritis, sepsis) and then determine its metrics. With perfectly informative evidence, the answers should be the same using either method. The question is which approach best reduces the opportunity for overlapping.

Results

The team identified 31 conditions that were the most likely to transition to a secondary condition such as sepsis and respiratory failure. It was felt that the first approach, as described above, would be the easiest to implement and would have the greatest reduction in overlapping conditions. The identified conditions were primarily infectious conditions, like UTI and pneumonia (which could lead to both respiratory failure and sepsis), toxic inhalations, cardiac arrest, seizures, and trauma. Once these conditions were identified, the conditions were divided between the four clinicians on the team to identify those that were not consistent with the others in way they were approached. There were 13 conditions that were found to be problematic. Some condition definitions needed to be changed to eliminate references to transitions or to update them in cases where the definitions were out of date. Some conditions required new evidence to correct the loss of crew life, and one condition was felt to have so much overlap that it was recommended for elimination. A second effort required modification of the sepsis incidence calculation to prevent double counting of the conditions, such as prostatitis, that could progress to sepsis.

Conclusion

The team made significant progress in clarifying the method for dealing with transitions from one medical condition to another. In addition, errors were found and corrected in definitions, incidence, and loss of crew

life as well as a condition in which reference was made to a CLiFF that was no longer included. These modifications will provide greater fidelity in the IMPACT model and reduce overlap.