INTEGRATED MEDICAL MODEL PROJECT – OVERVIEW AND SUMMARY OF HISTORICAL APPLICATION

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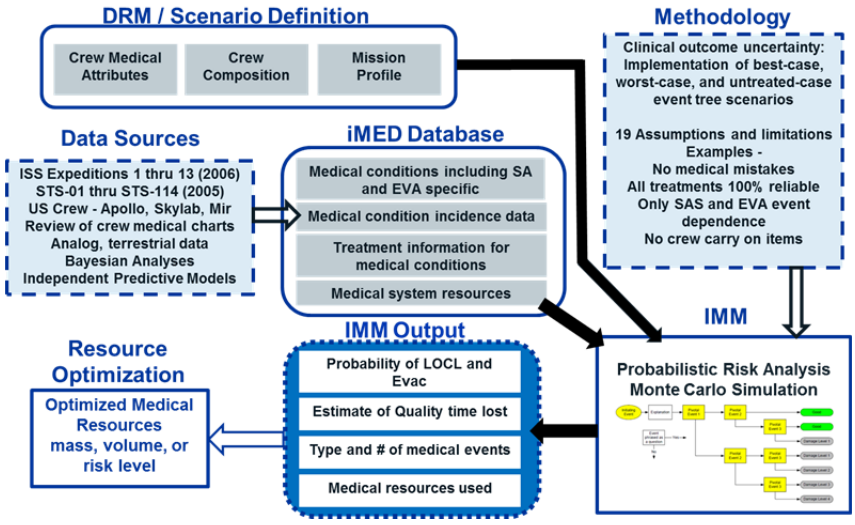
Introduction: The Integrated Medical Model (IMM) Project represents one aspect of NASA's Human Research Program (HRP) to quantitatively assess medical risks to astronauts for existing operational missions as well as missions associated with future exploration and commercial space flight ventures. The IMM takes a probabilistic approach to assessing the likelihood and specific outcomes of one hundred medical conditions within the envelope of accepted space flight standards of care over a selectable range of mission capabilities. A specially developed Integrated Medical Evidence Database (iMED) maintains evidence-based, organizational knowledge across a variety of data sources. Since becoming operational in 2011, version 3.0 of the IMM, the supporting iMED, and the expertise of the IMM project team have contributed to a wide range of decision and informational processes for the space medical and human research community. This presentation provides an overview of the IMM conceptual architecture and range of application through examples of actual space flight community questions posed to the IMM project.

Methods: Figure 1 illustrates the IMM modeling system and scenario process. As illustrated, the IMM computational architecture is based on Probabilistic Risk Assessment techniques. Nineteen assumptions and limitations define the IMM application domain. Scenario definitions include crew medical attributes and mission specific details. The IMM forecasts probabilities of loss of crew life (LOCL), evacuation (EVAC), quality time lost during the mission, number of medical resources utilized and the number and type of medical events by combining scenario information with in-flight, analog, and terrestrial medical information stored in the iMED. In addition, the metrics provide the integrated information necessary to estimate optimized in-flight medical kit contents under constraints of mass and volume or acceptable level of mission risk.



Results and Conclusions: Historically, IMM simulations support Science and Technology planning, Exploration mission planning, and ISS program operations by supplying simulation support, iMED data information, and subject matter expertise to Crew Health and Safety and the HRP. Upcoming release of IMM version 4.0 seeks to provide enhanced functionality to increase

the quality of risk decisions made using the IMM through a more accurate representation of the real world system.