PHM Applications in Emergency and Aerospace Medicine

Daniel M Buckland MD PhD
Assistant Professor, Duke University
Division of Emergency Medicine
Department of Mechanical Engineering and Materials Science

How can PHM concepts and methods be applied to the human system?

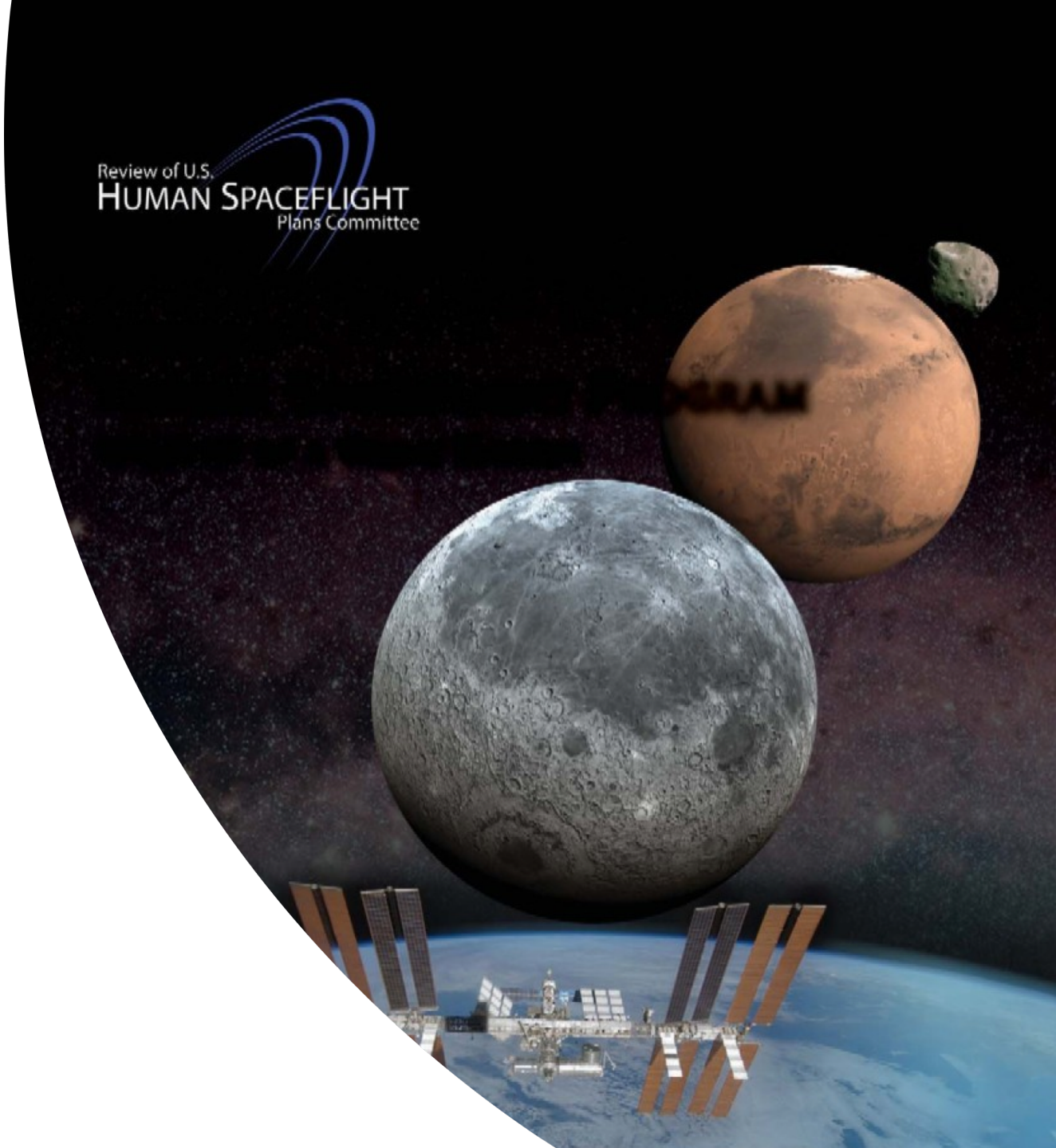
Aerospace Medicine

- Identified Risks
- PHM value add
- Larger Context
  - Medical Data Architecture
  - Medical Systems Engineering
  - Vehicle and Mission Integration
- Limitations and Challenges
  - Data
  - Program Expectation and System Integration
  - Lack of Evidence Base

Emergency Medicine

- Current landscape
- PHM value add
- Larger Context
  - Medical Data Formats
  - System Engineering
  - System Integration
- Limitations and Challenges
  - Data
  - Healthcare System Expectation and Integration
  - Lack of Evidence Base

PHM Applications in Aerospace Medicine



Major Organ Systems Affected by Spaceflight

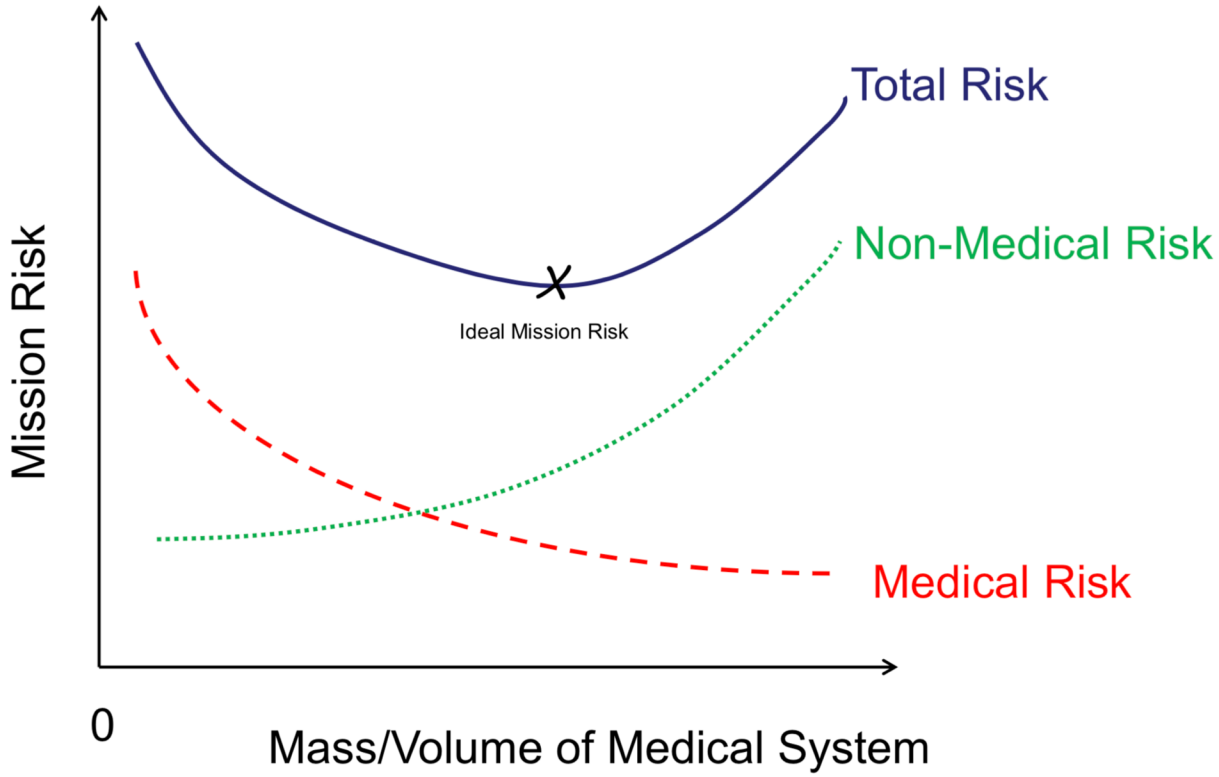
- Bone
- Muscle
- Vision
- Heart and Blood Vessels
- Immune
- Brain

Crew Health and Performance System

- Environmental Hazard Protection
  - Radiation
  - Noise
  - Vibration
  - Gases..
- Keep Healthy Crew Well
  - Exercise
  - Food
  - Behavioral Health
- Acute Care
- Longitudinal Health Maintenance
  - Data System
    - Data Capture
    - Training
  - Device Lifecycle
  - Consumable Supplies
    - Medications
  - Crew Activities
    - Procedures
    - Training
    - User interfaces

Integration into Entire System

Making the medical risk outputs integrate with existing engineering models of risk so the models can interact with each other.



Changing Paradigms

- Preventative -> Reactive -> Predictive
- Improving the ability to predict rather than react can mean the difference between mission success and mission failure

Limitations and Challenges

- Medical Data formats
- Expectations when dealing with Engineer/MD teams
- What data are the models based off of?

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Current Uses of Modeling

Diseases

- Sepsis
- Simple decision rules

Flow

- Rules of Thumb
- Quality Improvement

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- Current context
  - Diagnostic accuracy is not a useful metric
  - Data sources are not ideal
  - Databases are not standardized
  - Data formats/timepoints are irregular
  - Data points are not replicated
  - MDCalc.com

Changing Paradigms

- Preventative -> Reactive -> Predictive
- Improving the ability to predict rather than react can mean the difference between living and dying
- Outcomes: acuity of illness, amount of resources needed
  - Diagnosis if I can get it, but less important than the rest

Changing Paradigms

- Preventative -> Reactive -> Predictive
- Improving the ability to predict rather than react can mean the difference between living or dying, high or low cost, and minor or invasive interventions.
- Outcomes: acuity of illness, amount of resources needed
  - Diagnosis if I can get it, but less important than the rest

Limitations and Challenges

- Medical Data formats
- Expectations when dealing with patients and multiple specialties?
- What data are the models based off of?

Questions and a Plea

dan.buckland@duke.edu

Bring me your mature models